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THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

THE LOS ANGELES MEETING OF THE PACIFIC DIVISION

By Dr. J. MURRAY LUCK
SECRETARY

THE nineteenth annual meeting of the Pacific Division and its affiliated societies, held under the auspices of the University of California at Los Angeles, may properly be regarded as one of the most successful in the history of the division.

Few would be disposed to regard attendance alone as an adequate criterion of a successful meeting, but it is worthy of note that the Los Angeles meeting was the largest in the history of the division. The attendance of members and guests exceeded all expectations. The actual registrations reached a total of 779, to which might be reasonably added an additional 200, which represents a conservative estimate of the number that failed to register. Approximately 75 of those in attendance came from beyond the territory of the Pacific Division.

Much of the success of the meeting was unquestionably due to the generous and unstinted cooperation of the University of California at Los Angeles. All the sessions were centralized in the excellent lecture theaters of buildings within close reach of registration headquarters in Kerckhoff Hall. The arrangements for meals, special luncheons and banquets were well organized, despite difficulties of no small magnitude arising from the unexpectedly large attendance. Dormitory accommodations upon the campus are as yet inadequate for the entertainment of large conventions, but many private homes in Westwood Village provided hospitality for visitors, and rapid transportation between the university and the hotels of Santa Monica, Hollywood and Los Angeles was available. A general reception to members and guests was

graciously tendered by the university, officially represented by Provost E. C. Moore. Alexander Schreiner, university organist, kindly gave a special organ concert on Wednesday, June 26. In addition to excursions of special scientific interest, numerous trips of more general appeal were arranged—to the beautiful gardens and galleries of the Huntingdon Library and Art Museum at San Marino, to the Santa Monica and San Gabriel Mountains, Mt. Lowe, Santa Catalina Island, the Rancho Santa Ana Botanical Garden and other places of unusual interest.

A number of special luncheons and banquets, arranged by the various societies, were held during the week. Among them might be mentioned the Biologists' Dinner, sponsored by the Western Society of Naturalists and attended by about 150 members and guests. The banquets of the Astronomers, Entomologists and Psychologists and the special luncheons of the Physicists, Soil Scientists and Oceanographers were also highly successful.

Viewing the sessions in retrospect one can not fail to be struck by the number of symposia, 11 in all, including several of outstanding interest. There is no doubt that this is indicative of a growing tendency on the part of science to seek correlation among related fields of research, integration of the miscellany of fact contributed by numerous investigators, and more frequent definition of the state of knowledge.

GENERAL SESSIONS

The meetings opened officially on Tuesday, June 25, after an advance registration by the Western Society of Soil Science, in session on Monday, June 24.

In accordance with the policy developed in recent meetings of the division the introductory session was given over to a symposium designed to be broad in scope and of special regional interest.

The subject of earthquakes was selected. As a general introduction Professor Owen C. Coy, of the University of Southern California, described the Californian earthquakes of the past 150 years, commencing with the graphic records of Portolas, relative to the quake of 1769, and concluding with the temblor of 1933. Professor Perry Byerly reviewed the work of the seismological laboratories and stations of the University of California, and Professor Beno Gutenberg, of the California Institute of Technology, discussed the geographical distribution of the regions of earthquake activity throughout the world. A full account of the extensive seismologic work of the U. S. Coast and Geodetic Survey was given by Dr. T. J. Maher. The problems attendant upon the construction of earthquake-resistant buildings and the results of experimental studies bearing upon this subject were presented by Professor Lydik Jacobsen, of Stanford University. Dr. George B. MacDougall, of the Department of Public Works at Sacramento, outlined the questions involved in the drafting and enactment of legislation adequate to ensure the construction of buildings of maximum safety. Several of the speakers emphasized the important fact that the hazards of earthquakes can be virtually completely overcome by the construction of properly designed buildings.

The second general session, held on Tuesday afternoon, consisted of reports on the progress of research in three selected fields. Professor V. O. Knudsen reviewed recent developments in acoustics, Professor Th. Dobzhansky discussed recent work in genetics in relation to the mechanism of heredity and Professor B. M. Allen outlined a number of the problems of commanding interest in present-day research in endocrinology.

It is the policy of the executive committee, in organizing, year by year, the meetings of the division to provide for similar surveys of current research in selected subjects of outstanding significance.

On the morning of Wednesday, June 26, a joint symposium was held on the virus diseases of plants and animals, in which four of the affiliated societies collaborated: the American Phytopathological Society, Pacific Division; the Botanical Society of America, Pacific Section; the Society for Experimental Biology and Medicine and the Western Society of Naturalists. Dr. John F. Kessel, of the University of Southern California, was in direct charge of the general arrangements.

Four major topics were discussed:

The nature and properties of viruses: E. W. SCHULTZ, Stanford University.

The relation of viruses to plant tissues: C. W. BENNETT, U. S. Department of Agriculture, Riverside.

Virus diseases of animals in California: C. M. HARING, University of California, Berkeley.

Immunity in virus diseases of man: ANSON HOYT, University of Southern California.

A novel and interesting feature of the symposium consisted in several demonstrations of virus techniques, presented as follows:

Filtration technique: T. D. BECKWITH and H. H. THORNBERG, University of California at Los Angeles.

Technique of handling insect vectors: EUBANKS CARSNER, U. S. Department of Agriculture, Riverside.

The use of stream double refractions in the study of viruses: T. E. RAWLINS and WM. N. TAKAHASHI, University of California, Berkeley.

Electrokinetic phenomena of viruses: C. E. CLIFTON, Stanford University, and ROY T. FISK, University of Southern California.

Among other symposia which aroused great interest was one on the geologic and the cosmic age scales organized by the American Physical Society and the

Astronomical Society of the Pacific. Abstracts of the six papers presented in the symposium have been published in this journal.[1]

Addresses of general interest were delivered in Royce Hall on the evenings of June 25, 26 and 27 by Dr. Bailey Willis, of Stanford University; Dr. Fred Wright, of the Carnegie Institution of Washington, and Dr. Karl F. Meyer, of the University of California, respectively. Dr. Willis, the retiring president of the Pacific Division, spoke on "The Living Globe." After discussing the usual theory that the earth is slowly becoming cooler and cooler, he developed an alternative view that the fluid mass of the central core may be becoming hotter and hotter and, extending towards the crust, may eventually cause the earth to become a small but shining star. Dr. Wright, speaking on "The Surface of the Moon," reviewed the influences which the moon, according to legend and ancient folk-lore, exercises upon man. The major portion of the address was devoted to a résumé of our present knowledge of lunar physiography and topography, including mention of current work on the nature of the materials constituting the lunar surface. Dr. K. F. Meyer presented an address of considerable interest on "Plague, Past and Present." The causes of several of the important plagues recorded in history were considered. Special attention was given to selvatic plague foci, endemic within recent years in South Africa and California.

Mention should be made of three motion pictures which were presented on Thursday afternoon: Encystment and Excystment in Ciliated Protozoa (courtesy of Professor C. V. Taylor); The Nature of Living Cells as Revealed by Micro-Operations; Various Aspects of Cells in Living Tissues (courtesy of Professor Robert Chambers and C. G. Grand).

Among the excursions, of which many were planned, it is possible to refer to only a few. Those of scenic interest and non-technical in character have already been mentioned. A trip to the Mt. Wilson Observatory, including an illustrated lecture on the work of the observatory and inspection of the larger telescopes, was greatly enjoyed. The Los Angeles Museum and Rancho La Brea, the San Dimas Watershed, the Citrus Experiment Station and School of Tropical Agriculture at Riverside and the California Institute of Technology at Pasadena were also visited.

SESSIONS OF THE AFFILIATED SOCIETIES

Fifteen of the affiliated and associated societies participated in the meetings, and 383 papers were presented. The reports of the various sessions follow.

[1] SCIENCE, 82: 51, 1935.

AMERICAN ASSOCIATION OF ECONOMIC ENTOMOLOGISTS PACIFIC SLOPE BRANCH

(Report by H. A. Scullen)

Without a doubt the outstanding paper presented at the Entomological meetings at Los Angeles was the invitation address by Professor Harry S. Smith on "The Rôle of Biotic Checks in the Determination of Population Densities." Some forty or more additional papers were presented, and the meetings were attended by about one hundred entomologists. An unusually large number of papers related to various types of chemical controls. Five papers dealt specifically with codling moth control and ten with citrus insects.

In addition to the above, Dr. W. B. Herms gave a report on the transmission of California relapsing fever by a tick; Stanley F. Bailey gave an extended review on thrips as vectors of plant diseases; G. H. Vansell presented a paper on the origin of color in western beeswax; H. H. Stage reported on mosquito-control work in the Northwest under work-relief projects; Stanley E. Flanders reported on "The Effect of Host Density on Parasitism"; R. L. Patton and G. Allen Mail reported on the losses caused by Say's plant bug in Montana; S. B. Freeborn reported on the color preferences of the housefly; Robert L. Kitchel presented the results of studies on respiration of the cockroach; L. S. Jones presented some notes on the life history and control of the peach-twig borer, *Anarsia lineatella* Zell.; and J. R. Eyer reported the California Prionus as a serious pest on fruit trees in New Mexico.

Officers elected for the ensuing year are: *President,* H. A. Scullen; *vice-president,* A. L. Strand; *secretary-treasurer,* John F. Lamiman.

AMERICAN METEOROLOGICAL SOCIETY

(Report by Burton M. Varney)

C. C. Conroy, in a paper on "Early Los Angeles Raingages," gave a historical and descriptive outline of the development of raingages and of precipitation records in Los Angeles from the earliest known (1855, with Tennent gage) to the general public acceptance of the Signal Service records in about 1890. A paper by H. P. Gillette, "Cycles Causing the Present Drought," discussed the pre-record methods of tracing precipitation changes, including the Sequoia tree-ring counts of Douglass, the varves in silt deposits of ancient glacial lakes and the recessional moraines deposited during the last Ice Age. These, he states, unite in disclosing twelve cycles, notably the largest of a 155-year period whose next minimum will be reached in 1939 and another of 69 and two thirds years whose last minimum occurred in 1934. Mr. Gillette believes

that the close confluence of these minima explains the wide-spread drought of 1935. The value of analyzing in detail the local characteristics of temperature, wind, precipitation and humidity on a given tract of land previous to utilization of it was clearly shown by F. A. Carpenter. Two large areas were subjected to climatic surveys which led to great financial saving through proper location of plantings. In one of these areas a change from unprofitable agricultural use to profitable summer resort use was based on the findings of a climatological survey. L. M. Daingerfield's paper on "Terminology Trends in Meteorology" showed the need of taking stock of our technical terms in a science evolving as rapidly as is meteorology, in the interest of clarity and avoidance of duplication. L. E. Blochman, discussing "Seasonal Long-Range Forecasting," stated his belief that a greater persistency of weather types on the Pacific Coast under oceanic domination gives this region some advantage over the Atlantic Coast. Winter storm tracks were discussed as well as the assistance afforded by the Daily North Pacific Chart issued by the San Francisco Weather Bureau Office. J. W. Smith presented a qualitative summary of the climatic characteristics of northern Nevada based on its outstanding features of aridity and strong daily and annual ranges of temperature in conjunction with the marked effects of contrasting mountain-and-plains topography in the region. The relation of meteorological phenomena in southern California to the local fruit industry was discussed by Woodbridge Metcalf, who showed the great importance of windbreaks in protecting orchards from the desiccating "Santa Ana" or foehn wind; by G. P. Weldon, who showed how delayed foliation in peach trees was associated with winters of plus departures from the normal temperature; and by S. H. Cameron and R. W. Hodgson, who presented a study of average early spring temperatures in their relation to the size of the avocado crop. L. G. Gray, dealing with "California Forest Fire Economics," showed that fire damage and suppression costs vary directly with trends of air temperature in the region and pointed out several useful applications of this fact to forest administrations and fire weather research. J. E. Jones reviewed the technique and some of the problems of "Snow Surveying for Short-Time Forecasting," discussing the types of snow courses, selection of standards of reference for determining "normal" water content, the factors that affect the accuracies of stream run-off estimates. He showed that the run-off forecasts were usually within 10 per cent. of observed run-off. J. G. Brown dealt with "The Relation of Atmospheric Electricity and Meteorology." He advanced the theory that, owing to greater ionization of the air at high levels, with the lower air as a dielectric, a condenser is formed with the earth as the negative plate and the upper air as the positive. The current across the dielectric is offset by a return flow in thunderstorms when the earth's charge beneath the storm is of opposite sign and the condenser thus is kept charged. Without thunderstorms, it might lose its charge in a few minutes. A large group of papers dealt with various aspects of air-mass analyses. A paper by H. C. Huang treated some of the air-mass types found in Northern China, notably the cool, dry type from Siberia, the warm, moist type from the Yellow Sea and the hot and very dry type from the interior of Asia to the southwest. Upper air soundings by means of kites were used to determine the properties of these different masses. I. P. Krick undertook to apply the wave motions of the tropopause resulting from the disturbance of two sloping discontinuity surfaces separating three dissimilar fluids, to the extension of weather prediction in certain localities from the usual 36 to 48 hours to as long as a week or ten days. He made specific application to the North Pacific-Great Basin region, discussing the relationship of intense lows over the ocean to the formation of plateau anti-cyclones, and the possibility of long-range prediction for the western United States if the formation and magnitude of the anti-cyclone can be predicted. W. M. Lockhart presented a study of the west coast inversion as applied to navy aviation forecasts for the San Diego area. He finds that when the inversion is low the ceiling is also low and the stratus breaks during the day, but that a higher inversion may cause fairly high cloudiness to persist throughout the day. He pointed out that a study of the upper-air winds with particular attention to the passage of fronts aloft seems to give the most reliable clue to the probable depth of the surface layer of maritime air. Further information on the behavior of two groups of tropical storms forming on the southwest coast of North America was contributed by Dean Blake. One group originates in summer and early fall in very low latitudes off the Mexican coast and moves northwestward under the influence of upper-air flows on the southwestern side of the high-level anti-cyclone that overlies the semi-permanent thermal low of our Southwest. It was suggested that the other group, off the Lower California coast, may originate in the known high-level movements of air from the south when a deep high overlies the western United States. Progress toward quantitative forecasting of precipitation was indicated by J. R. Fulks's paper on "Rates of Precipitation from Adiabatically Ascending Air," in which he gave an approximate and simple formula and a chart derived therefrom for estimating hourly precipitation rates according to any combination of temperature, pressure, vertical velocity and thickness

of the air layer involved. A. B. Carpenter described a noteworthy example of subsidence in a stagnated dome of air over the northwest United States. Air drainage from this region was slow, owing to the high mountain ranges. Fog and low cloudiness accompanying the stable conditions were related to the sloping subsidence layers, lasted about three weeks, and ended when a low area to the south set up a gradient, draining off the air in that direction. A paper by G. M. French on coastal cloud types of southern California described cumulus formation in unstable polar air near the southern California coast. These clouds form off-shore at night, when the interior is clear, and over the land in the daytime when the weather is clear over the ocean. The result is much the same whether the source region of the air is Canadian or North Pacific, provided the trajectories of the masses carry them over the ocean before reaching our coast. These clouds seem to form within cold sectors rather than on cold fronts. Introducing the two next-noted papers, F. H. Hay described the meteorological work of the Los Angeles County Flood Control District and showed some of the extraordinary difficulties involved in solving the local precipitation-and-run-off problem. W. J. Wood then discussed the precipitation records of the district in terms of their historical development and of the requirements for further perfecting the fundamental data. R. S. Goodridge, dealing with "Storm Patterns," related the development of curves of cumulative precipitation to types of storms over southern California: the occlusion type, in which precipitation slowly increases as mountain-dammed cool southwesterly air is overrun by Tropical-Pacific air and often reaches a damaging climax when the Tropical-Pacific air is occluded by incoming Polar-Pacific air; and the comparatively rare thunderstorm type in which precipitation initially is usually great and diminishes thereafter. A group of papers on the distribution and measurement of precipitation over the San Dimas experimental forest was introduced by E. I. Kotok with a general description of the project and statement of the precipitation problem. H. G. Wilm then explained the factors governing the choice of locations of the 175 raingages for obtaining the most nearly satisfactory picture of the distribution of precipitation. H. C. Storey compared the statistical and isohyetal methods for analyzing the resulting rainfall measurements.

AMERICAN PHYSICAL SOCIETY, 200TH MEETING

(Report by Leonard B. Loeb, local secretary for the Pacific Coast)

The two hundredth meeting of the American Physical Society was held in affiliation with the Pacific Division, American Association for the Advancement of Science, at the University of California at Los Angeles during the period from June 26 to June 29. The program consisted of the following items:

On Wednesday, June 26, a symposium on "The Geologic and Cosmic Age Scales," in cooperation with the Astronomical Society of the Pacific, with the following titles:[2]

The age of the earth from sedimentation: GEORGE D. LOUDERBACK, University of California, Berkeley.

The age of the earth from radioactive disintegration products: ROBLEY D. EVANS, Massachusetts Institute of Technology.

The age of the earth from the changes in its temperature and elastic properties: BENO GUTENBERG, California Institute of Technology.

The age of the galaxy from the disintegration of Galactic star clusters and binary star systems: G. P. KUIPER, Lick Observatory.

The age of the universe from the red shift in the spectra of extragalactic objects: RICHARD C. TOLMAN, California Institute of Technology.

On attempts to reconcile the long and the short-time scales in cosmogony: PAUL S. EPSTEIN, California Institute of Technology.

On Thursday, June 27, a symposium on "Nuclear Structure," with the following program:

A survey of present knowledge of the nucleus: CARL D. ANDERSON, California Institute of Technology.

Recent developments in artificial transmutation: ERNEST O. LAWRENCE, University of California.

Gamma rays from nuclear transmutations: H. RICHARD CRANE, California Institute of Technology.

A mathematical interpretation of nuclear phenomena: PAUL S. EPSTEIN, California Institute of Technology.

Absorption of high energy electrons: SETH H. NEDDERMEYER, California Institute of Technology.

Eccentricities of high explosives: ROBERT W. WOOD, Johns Hopkins University, president of the American Physical Society.

The last paper on this program did not fit into the subject-matter of the program. In view of the presence of President Robert W. Wood, of the American Physical Society, opportunity was taken of a vacancy at the end of the program to enable Professor Wood to speak on a topic of his own choosing.

On Friday and Saturday there was a program of thirty-nine contributed papers of ten minutes each by members of the society. In several cases it happened that a number of papers by different investigators dealt with the same subject, so that in place of the normal ten-minute program the papers were informally regrouped so as to make small symposia on these subjects. Particularly notable was the one on "Anomalous Diffraction Gratings," contributed to by Professors Wood, Strong and Langer.

[2] For abstracts of these communications see SCIENCE, 82: 51, 1935.

The meetings were highly successful and the exceptionally large attendance of over three hundred at the two symposia proved conclusively the value of symposia at the Pacific Division meetings alone. This was the first Pacific Division meeting in which the Physical Society attempted to hold symposia.

The attendance at the sessions where contributed papers were presented was in the neighborhood of a hundred.

American Phytopathological Society, Pacific Division

(Report by B. A. Rudolph, secretary-treasurer)

At the nineteenth annual meeting of the society, C. E. Owens, of Oregon State College, was elected president to serve one year. Four half-day sessions were held, at which twenty-three papers were read. Preceding the regular sessions the Pathologists and several other societies participated in a joint symposium on "Virus Diseases of Plants and Animals." Dr. C. W. Bennett represented the Pathologists, and his paper, "The Relation of Viruses to Plant Tissues," made a very favorable impression. Dr. Carsner, Dr. Thornberry and Dr. Takahashi demonstrated various virus techniques following the symposium. Brief reports of the papers presented follow: W. W. Mackie reported the possibilities of successful control of stem rust of wheat by means of sulfur dusting from airplanes. H. S. Reed and H. H. Thornberry described a very new peach disease in Southern California, the cause of which is still not wholly clear. D. E. Bliss described experiments demonstrating the causal agent of rots of three species of palm trees to be *Penicillium roseum*. L. D. Leach and A. E. Davey showed that suitable and timely applications of cyanamid to the soil or the application of either anhydrous ammonia or ammonium sulfate in proper quantities in irrigation water would greatly curtail attacks of southern sclerotium rot of sugar beets. They also suggested that solutions of anhydrous ammonia or ammonium salts applied to the soil may, with a sufficiently high pH, be effective in reducing infection by inhibiting the growth of the fungus. J. R. Eyer described the pathological histology of potato-leaf tissue affected with psyllid yellows and certain aspects of the biochemistry involved. C. M. Tompkins, C. M. Tucker and A. E. Clarke described a new root and stem rot on China asters caused by *Phytophthora cryptogea*. B. F. Dana and F. P. McWhorter reported a severe outbreak of "curly top" on pansy in Oregon in 1934. The beet leafhopper *Eutettix tenellus* was present in large numbers on the plants and considered to be responsible for transmitting the disease to them. C. O. Smith submitted a list of conifers which he found to be susceptible to attacks of crown gall in inoculation experiments. C. M. Tompkins, C. M. Tucker and M. W. Gardner described a root rot of cauliflower produced by *Phytophthora megasperma* Drechsler. J. T. Barrett and H. Parker reported a disease of the roots of *Stellaria media* which they have attributed to attacks by *Ligniera junci*. W. W. Mackie, H. Johann and N. E. Stevens reported and described a fungus disease of maize which appeared at Berkeley, California, in 1933. The fungus has been identified as a species of Sphaeropsis and greatly resembles *S. ambigua*, already reported on corn. W. C. Snyder described a new disease of pea in California presumably due to a fungus which as yet has not been positively identified. J. L. Hewitt advanced a hypothesis concerned with the possible creation of living matter from non-living matter. F. P. McWhorter described the pathological histology of narcissus leaves affected with mosaic. F. P. McWhorter and J. A. Milbrath reported a tip blight of tomato in Oregon which is probably due to a virus, but which differs in certain definite points from several other diseases of similar origin. F. P. McWhorter reported experiments which substantiate the theory which he presented at the sixteenth annual meeting of the society to the effect that tulip breaking results from the interaction of two antithetic viruses, one of which tends to add flower color and one that removes it. Results obtained experimentally by E. T. Bartholomew tend to show that while high soil moisture is conducive to endoxerosis of lemon fruits, during protracted hot weather trees having access to the least amount of water will show the greatest yield of endoxerotic fruit. J. M. Fife and V. L. Frampton described the effect of carbon dioxide on the pH gradient of the sugar beet and on the feeding of the curly-top vector. H. P. Severin and J. H. Freitag described the distribution of celery mosaic diseases in California and their symptomology. J. H. Freitag and H. P. Severin described experiments designed to show the number of days infective leafhoppers may be capable of transmitting curly-top to beets. J. T. Barrett discussed the taxonomy of *Rhizomyxa hypogea* Borzi and *Ligniera junci* (Swartz) Cook.

American Society of Ichthyologists and Herpetologists, Western Division

(Report[3] by R. B. Cowles)

Six communications were presented as follows:

(1) "The Breeding Habits of the Chub, *Mylocheilus caurinus* (Richardson) (Cyprinidae)," Leonard P. Schultz. A description of the behavior of schools of chub during spawning activities in Lake Washington.

(2) "The Growth of the Rattlesnake," L. M. Klauber. Captive specimens, which fail to grow natu-

[3] Abbreviated. J. M. L.

rally, were not used. A growth curve was plotted from measurements made on 450 specimens of the Pacific rattlesnake captured in San Diego County. Observations on weight, length, number of rattles, age and mating were recorded.

(3) "Sand Dune Reptiles from Baja California and the Problem of Convergent Evolution," Walter Mosauer. A description of three sand reptiles from the dunes of the Vizcaino desert. A comparison is made of the dune biota in different deserts.

(4) "Intergradation in the Genus Salvadora and its Bearing on the Phylogeny of the Genus," C. M. Bogert. Intergradation between three species of *Salvadora grahamiae* are considered: *S. g. grahamiae*, the typical form of the Mexican plateau and south central United States; *S. g. hexalepis* of the southwestern deserts; and *S. g. virgultea* of the southwestern coastal area of California and northwestern Lower California.

(5) "Color Change and Color Mechanism in Reptiles," Sarah Atsatt. The relative significance of heat and light on the color change of iguanids and the *Xantusiidae*.

(6) "The Toleration of Solar Heat by Desert Reptiles," Walter Mosauer. Contrary to popular opinion, desert lizards have no greater toleration of high temperatures than nocturnal snakes.

A series of 130 Agfa Autochromes, illustrative of variations in pattern and color of reptiles and amphibians, was shown by Dr. Cowles, and an exhibit of living reptiles and amphibians, prepared by C. M. Bogert, L. M. Klauber and R. B. Cowles, was placed on view.

Officers for the coming year were elected as follows: *President,* Dr. Sarah Atsatt; *vice-president,* Dr. Rolf Bolin; *secretary,* Dr. Arthur Svihla.

ASTRONOMICAL SOCIETY OF THE PACIFIC

(Report by Frederick C. Leonard, chairman, Program Committee)

The sessions on June 26 were devoted to joint symposia with the American Physical Society. The forenoon symposium was on "The Geologic and the Cosmic Age Scales."[4]

The afternoon session opened with a discussion of these papers, followed by a symposium on "The Technique of Metallizing Mirrors and the Performance of Metallized Telescope Mirrors," at which the following two invited addresses were given: (1) "The Technique of Depositing Aluminum by Evaporation on Telescope Mirrors," John Strong, California Institute of Technology; (2) "The Reflectivity of the New Aluminum-Magnesium Alloy in the Near Ultra-Violet," Hiram W. Edwards, University of California at Los Angeles.

These papers were followed by "Reports on the Performance of Aluminized Telescope Mirrors in Use at the Lick and the Mt. Wilson Observatories, by Members of their Staffs," namely, G. P. Kuiper, of the Lick Observatory, and A. H. Joy and R. S. Richardson, of the Mt. Wilson Observatory. After further discussion of the subject-matter of this symposium, the following paper, whose title was received too late for inclusion in the printed program, was delivered: "The Transformation of a Spherical into a Parabolic Mirror by Controlled Deposition of Aluminum," by John Strong and E. Gaviola, California Institute of Technology.

At the morning sessions of the Astronomical Society, on June 27 and 28, the following nineteen miscellaneous papers were read, in most cases by their authors:

The photometry of electric furnace absorption multiplets: ROBERT B. KING and ARTHUR S. KING, Mt. Wilson Observatory.

Recent developments in meteoritics: FREDERICK C. LEONARD and ROBERT W. WEBB, University of California at Los Angeles.

Remarks on the establishment of a scale of wave lengths in the infra-red solar spectrum: HAROLD D. BABCOCK, CHARLOTTE E. MOORE and WENDELL P. HOGE, Mt. Wilson Observatory.

The photometry of the magnesium b group in the solar spectrum: ERNEST CHERRINGTON, JR., Lick Observatory.

Some exceptional features of hydrogen flocculi: R. S. RICHARDSON, Mt. Wilson Observatory.

A comparison between the radiation from the moon and from Mercury: EDISON PETTIT and SETH B. NICHOLSON, Mt. Wilson Observatory.

A program for general perturbations of the minor planets: A. O. LEUSCHNER and SOPHIA H. LEVY, University of California, Berkeley.

The origin of the light of the night sky: JOSEPH KAPLAN, University of California at Los Angeles.

Preliminary report on observations of Mars in 1935: E. C. SLIPHER, Lowell Observatory.

The constitution of the star cluster in Coma Berenices: R. J. TRUMPLER, Lick Observatory.

The mass of the Virgo Cluster: SINCLAIR SMITH, Mt. Wilson Observatory.

Reexamination of spectroscopic binary orbits: W. E. HARPER, Dominion Astrophysical Observatory.

Spectrographic elements of the eclipsing variables AN Cephei, GO Cygni, MR Cygni and TX Ursae Majoris: J. A. PEARCE, Dominion Astrophysical Observatory.

Provisional elements of the visual binary Beta 1026 (A. D.S. 148): JOHN A. RUSSELL, University of California at Los Angeles.

The behavior of carbon, nitrogen and silicon in the spectrum of P Cygni: C. S. BEALS, Dominion Astrophysical Observatory.

[4] *Cf.* American Physical Society, page 261 and SCIENCE, 82: 51, 1935.

The radial velocity of Alpha Lyrae: F. J. NEUBAUER, Lick Observatory.

New velocities of extragalactic objects: M. L. HUMASON, Mt. Wilson Observatory.

The variability of Epsilon Lyrae: E. A. FATH, Goodsell Observatory of Carleton College.

An investigation of selective absorption in the Aquila region of the Milky Way: CLIFFORD E. SMITH, Lick Observatory (the only paper on the program to be read merely by title).

The afternoon session on June 27 was given over to a symposium on "Nova Herculis," consisting of the following four invited papers:

Some unusual features of the spectrum of Nova Herculis: A B. WYSE, Lick Observatory.

Radial velocities from absorption lines in the spectrum of Nova Herculis: W. S. ADAMS, W. H. CHRISTIE, A. H. JOY, R. F. SANFORD and O. C. WILSON, Mt. Wilson Observatory.

Displacements of the sodium lines in the spectrum of Nova Herculis: PAUL W. MERRILL, Mt. Wilson Observatory.

Cyanogen bands in the visual region of the spectrum of Nova Herculis: ROSCOE F. SANFORD, Mt. Wilson Observatory.

The program concluded with an excursion to the Griffith Observatory in the early afternoon of Friday, June 28, followed immediately by an excursion to the Mt. Wilson Observatory.

BOTANICAL SOCIETY OF AMERICA, PACIFIC DIVISION

(Report by F. Murray Scott, secretary)

Two symposia and three general sessions were held on June 26, 27 and 28, Dr. O. L. Sponsler, president, presiding at the latter. Papers on the following subjects were presented: Life history of *Pelagophycus porra;* the periodic fruiting of Halicystis; the carbohydrate in the plant *Irideae laminarioides* and the isolation of a new polysaccharide, sodium sulphuric acid ester of galactan; effects of sun blotch on the anatomy of the avocado, *Persea drimifolia;* poison oak, poison ivy, the plants and their poisons; the histogenesis of foliar transition forms in Carya; five thousand miles of exploration for Cupressus in California; the effect of hydrogen peroxide on hastening the germination of *Pinus coulteri;* a respiration study of detached roots; the recovery of HCN absorbed by citrus foliage; the growth and yield of lemon trees as affected by differential water treatments; the amylolytic activity in orange leaves; the physiological basis of genetic dwarfs in corn; the origin of growth hormone in avena coleoptile; some relations between electric polarity and growth in plants; on the effect of ethylene in root formation; root formation on stem cuttings induced by hormones.

A symposium on plant pigments was held on Thursday afternoon, Dr. A. R. Davis, University of California, Berkeley, presiding. The following topics were discussed: "The Plastid Pigments of the Dodder, *Cuscuta salina,*" Dr. G. Mackinney; "Chlorophyll Changes in Algae," Dr. M. C. Sargent; "Preliminary Studies on Chlorophyll Formation," Dr. D. Appleman; "Chlorosis," Dr. J. P. Bennett.

The society also participated in the joint symposium on the virus diseases of plants and animals.

Among the field trips scheduled was a visit to the rapidly growing Botanic Garden of California native plants, the Rancho Santa Ana property of Mrs. Ernest A. Bryant, where Dr. C. B. Wolf is the botanist in charge.

Officers for the coming year were elected as follows: *President,* Dr. T. C. Frye, University of Washington; *secretary,* Dr. G. B. Rigg, University of Washington.

ECOLOGICAL SOCIETY OF AMERICA

(Compiled from the Bulletin of the Ecological Society, June, 1935)

In addition to a symposium on "Chaparral in Relation to Erosion and Fire Control," presided over by Charles J. Kraebel, the following seven communications were presented:

Some Southern California hydrothermals: H. DE FOREST, University of Southern California.

The vegetation of Baja California: FORREST SHREVE, Desert Laboratory, Carnegie Institution, Tucson.

Moisture relations in the chaparral of the Santa Monica Mountains: HARRY L. BAUER, Santa Monica Junior College.

Soil moisture, soil temperature and growth in the chaparral: VIDA M. WATKINS, University of Southern California.

Biogeographical features of the North Coast Ranges of California: HAROLD W. CLARK, Pacific Union College.

The localization of Asilidae (robber-flies) in Colorado: MAURICE T. JONES, Colorado State College.

Growth in Convolvulus soldanella L.: EDITH A. PURER, Hoover High School, San Diego.

Abstracts of these papers have been published in the *Bulletin of the Ecological Society of America,* 16: 19–21 (June, 1935).

SOCIETY FOR EXPERIMENTAL BIOLOGY AND MEDICINE, SOUTHERN CALIFORNIA BRANCH AND PACIFIC COAST BRANCH

(Report by T. D. Beckwith)

The Southern California Branch and the Pacific Coast Branch of the Society for Experimental Biology and Medicine met on Thursday and Friday mornings. The aggregate attendance was between seventy-five and one hundred. Dr. J. F. Kessel, president of the

Southern California Branch, presided at one session. In the absence of Dr. W. H. Manwaring, president of the Pacific Coast Branch, Dr. T. D. Beckwith, incoming president of the Southern California Branch, presided at the second session.

Drs. H. Borsook and C. E. P. Jeffreys opened the session by showing that the mucosa of the intestine and the liver account for the greatest part of uric acid formation from purines. J. M. Luck presented an interesting discussion in which he demonstrated that the increase in the size of the liver attending the use of certain protein diets must be classed as true hypertrophy. Roderick Craig and J. S. Yuill presented the results of a study of the development of fat in the larvae of the flesh fly (*Lucilia sericata,* Meig). The results have shown that this form of animal life synthesizes fats in large amounts. D. M. Greenberg and E. V. Tufts gave a summary of work carried on by them dealing with changes of body magnesium of the rat with age. They have demonstrated the interesting point that bony tissues of the body deplete more easily. Soft tissues tend to retain their magnesium content. This is a safeguard against magnesium tetany. Dr. D. L. Fox, while discussing some animal carotinoids, gave proof that certain fish can convert some of these compounds to others. A valuable discussion was presented by Drs. Lewis Gunther and D. S. Mackinnon, in which they compared the occilographic electrocardiogram with the more usual string type of machine. Dr. Hazel E. Field outlined results of extensive research on the effect of tobacco smoke on the experimental animal. Among other interesting points, she showed that tobacco smoke changes the structure of adrenals. Thus it appears likely that tobacco smoke has a definite effect upon the endocrine balance of the body. B. L. Davis, while discussing certain constituents of the adrenal gland, presented information on the effects of acetylcholine on the blood sugar and amino-acid content of experimental animals. By C. C. Lindegren, a fascinating relationship was shown genetically between the G. type of an organism and its more usual form. This paper therefore dealt with certain nuclear structures among the bacteria. *B. acidophilus* in soybean milk was discussed by T. D. Beckwith and B. L. Golden. They indicated that this organism undergoes a peculiar fragmentation and that it forms units nearly sub-microscopic in size. R. V. Stone presented his discovery of a method whereby the food poisoning type of staphylococcus may be recognized through certain critical culture reactions. Dr. Anson Hoyt has shown that rabies anti-serum has definite protective value when used with the white mouse as an experimental animal. New and more adequate methods of isolating meningococcus were described by Dr. Roy T. Fisk. Dr. J. F. Kessel encountered a new virus while studying the 1934 poliomyelitis epidemic. His discussion was accompanied by an interesting series of moving pictures. A technique whereby, in a wet blood smear, recognition of cancer in the patient may be rendered more simple was explained by Lloyd Kennell and Dudley S. Cooper. Charles Weiss and Alfred Goldman described their experiments whereby, successfully, they have been able to study the formation of lung abscess in experimental animals. That excess blood may be absorbed from the circulatory system by some organ controlled by the oxygen tension of respired air was stated by David B. Tyler and Francis M. Baldwin. Drs. N. W. Shock and E. Ogden made the interesting statement that following severe exercise young girls of grade-school age recover more slowly than do boys of similar age. By M. T. Burrows, data were presented that definite relationships existed between the presence of dead or degenerate tissues of the body and the appearance of cancer.

WESTERN SOCIETY OF SOIL SCIENCE

(Report by H. D. Chapman, secretary)

Three half-day sessions were held with attendance ranging from 35 to 75. A number of interesting papers and much discussion centered around the influence of soil alkalinity on the absorption and utilization of iron and other minor constituents of plants. One paper dealing with the utilization of various iron compounds in alkaline media was of interest in showing great differences in the availability of various iron oxides; magnetite and iron pyrites proved more available than hematite or carbonate; preparations of iron humate proved less available to corn plants than ferrous sulfate. The possible importance of intimate root-soil particle contact was stressed as possibly being one means by which plants secure iron from alkaline media. Physiologically acid nitrogen fertilizers and sulfur were found to increase significantly phosphate availability in calcareous soils. A careful physico-chemical study of factors affecting the pH of alkaline-calcareous soils revealed that soil-water ratio, fineness of division of calcium carbonate, protective coatings and salt effects were of great importance in changing the pH.

Of considerable interest in throwing new light on the nature, crystalline structure and properties of clay minerals was a study of the water losses of pure minerals, Bentonite and soil colloids, under the influence of variable temperatures. Similarities and differences between various clay minerals, bentonites and soil colloids, as shown by previous work of a different nature, were again manifest in the water retentiveness of these materials.

Studies of boron toxicity, as related to weed control, indicated the usefulness of boron containing com-

pounds mixed with chlorates as a substitute where arsenicals are undesirable. The studies reported also bore on the fixation and movement of boron compounds when applied to different soils.

The importance of organic matter and cover crops in the prevention of soil-nutrient losses by leaching under conditions of pineapple culture in Hawaii was shown by data presented. Marked differences in the transformations of organic matter in different soil types were shown in connection with studies carried on in Washington State College.

A partial explanation of the decline of old alfalfa fields in the West is suggested by experiments showing a gradual accumulation in old alfalfa plants of a root-nodule-bacteria-destroying substance (bacteriophage).

Of importance in the irrigation of sugar beets was the presentation of data showing that so long as the moisture content is kept from falling below the permanent wilting percentage, no differences in yield or sugar content of beets resulted. Wide differences in the soil-water level were maintained by varying methods of irrigation.

The following officers were elected for the coming year: *President,* R. E. Stephenson, Oregon State College, Corvallis; *vice-president,* R. L. Hibbard, University of California, Berkeley; *secretary-treasurer,* S. C. Vandecaveye, State College, Pullman, Washington.

Western Psychological Association

(Report by Howard C. Gilhousen)

The program of the Western Psychological Association consisted of meetings on Friday and Saturday. On the mornings of both days there were parallel sessions, both containing general experimental papers. Friday afternoon was devoted to a symposium on the topic: "Is the Quantitative Scientific Method Adequate for the Analysis and Prediction of Mental States or Behavior?" Professor R. C. Tryon outlined the issue, and the following contributed under the title of "The Point of View of": Conditioned Response, Professor Edwin R. Guthrie; Experimental Psychology, Professor Warner Brown; Social Psychology, Professor Knight Dunlap; Mental Measurement, Professor H. E. Garrett; Educational Psychology, Professor A. S. Raubenheimer; Comparative Psychology, Professor Edward C. Tolman; Gestalt Psychology, Professor R. H. Wheeler; Clinical Psychology, Professor Jean Macfarlane.

On Saturday morning one session was devoted to child psychology. This session was held jointly with the Society for Research in Child Development. The parallel Saturday session was devoted to comparative and physiological psychology. The afternoon session contained a variety of papers on learning and other topics.

On Friday evening the annual banquet was held in Kerckhoff hall, with about 100 persons attending. Professor Harold E. Jones gave an address, entitled "The Growth Study as a Psychological Method."

The following officers were elected for the ensuing year: *President,* Professor Grace M. Fernald; *vice-president,* Dr. Ralph Gundlach; *secretary-treasurer,* Dr. Robert C. Tryon.

Western Society of Naturalists

Exclusive of the symposium on virus diseases in which the society participated, some 23 papers were presented. Eight of these were on genetics and were grouped together to constitute the second session:

A four gene system of color inheritance in Clarkia elegans: L. L. Burlingame, Stanford University.

Heredity of "white anther" in Clarkia elegans: L. L. Burlingame, Stanford University.

Matthiola hybrids which indicate reciprocal translocation involving the A-chromosome: Howard B. Frost, University of California, Riverside.

Chromosome studies of the Pacific Coast trilliums: Harry E. Warmke, Stanford University.

New mutations in Drosophila pseudoobscura: Catherine V. Beers, University of Southern California.

The action of genes studied through deficiencies: D. F. Poulson.

Chromosomal differences between races: C. C. Tan, California Institute of Technology.

Inheritance of certain teratological forms in Clarkia elegans Dougl.: L. A. Waitzinger.

The remaining 15 papers were miscellaneous in character:

Studies in the structure and growth of the lamellibranch shell: Robert C. Miller, Harold D. Mitchell and Howard A. Coombs.

Observations on the distribution of marine invertebrates along the North Pacific Coast: John E. Guberlet and Robert C. Miller.

Studies in the seasonal distribution of plankton in Puget Sound and adjacent waters: Robert C. Miller, Charles C. Davis, Harry A. Hansen and Robert P. Dempster.

A biological reconnaissance of Portland Canal, Southeastern Alaska: Robert C. Miller, John E. Guberlet and James E. Galbraith.

Two new ecto-parasitic trematodes: John E. Guberlet.

The mechanism and biological significance of color changes in fishes: F. B. Sumner, Scripps Institution of Oceanography, La Jolla.

The climatic and evolutionary status of animals in relation to chemical properties of their fats: James B. McNair, Los Angeles.

The assimilation of ammonium by Nitzschia closterium and other marine phytoplankton: Claude E. ZoBell, Scripps Institution of Oceanography, La Jolla.

Evidences of structure in the cytoplasm of Plasmodium, Physarum polycephalum: A. R. Moore, Hopkins Marine Station, Pacific Grove.

The teeth of small fish from natural waters containing fluorine: ANDREW NEFF, California Institute of Technology.

Experiments on the source and amount of nitrogen used by Zootermopsis: R. E. HUNGATE, Stanford University.

The cause of the death of hundreds of cedar waxwings: M. L. FOSSLER, University of Southern California.

The relation of bacteria to the nitrogen metabolism of termites: ROBERT A. GREENE and EDWARD L. BREAZEALE, College of Agriculture, University of Arizona, Tucson, Arizona.

Auxiliary host in the life cycle of a lung worm: M. HOBMAIER, Hooper Foundation.

ASSOCIATION OF PACIFIC COAST GEOGRAPHERS

(Report by O. W. Freeman)

On June 27, 1935, the Association of Pacific Coast Geographers completed an organization. The society has applied for affiliation with the Pacific Division of the American Association for the Advancement of Science and plans to meet annually where the association meetings are held. A two-day session was held, at which 20 papers were presented. An annual yearbook will be published to contain abstracts of all papers presented, together with a few of the leading papers in full.

Officers for 1935–36 were elected as follows: *President,* Otis W. Freeman, State Normal School, Cheney, Washington; *vice-president,* George C. Kimber, Junior College, Sacramento, California; *secretary-treasurer,* W. B. Merriam, Department of Geography, University of Washington, Seattle, Washington.

On the morning of June 26 the program began with some observations bearing on the development of meanders in intermittent streams in the Colorado Plateau region by John Leighly. A transplanted culture by Italian-Swiss dairymen in the Santa Lucia Mountains of San Luis Obispo County was described by H. F. Raup. J. W. Hoover pointed out a close connection between sources of water and Papago Indian village sites in Arizona and Sonora. O. W. Freeman described the hop industry of the Yakima Valley, Washington, and W. B. Merriam the historical, physical and economic geography of the Rogue River Valley, Oregon. The human geography of the Quirigua region of Guatemala was described by Glenn Cunningham. In the afternoon a tour around Los Angeles harbor and vicinity was conducted by H. F. Raup.

On June 27 there were two papers on Lower California; one by Peveril Meigs described the historical geography and the other by Forrest Shreve discussed the human ecology. Edward N. Torbert presented a land utilization map of the intensively cultivated northern part of the Santa Clara Valley, California. J. E. Williams correlated the geology, landscape and climate with land utilization in the island of Majorca. Dot maps of the coal resources and production of China were presented by Barbara Woodruff and of the iron ore resources and production of China by Wilma Belden.

The political geography and settlement of northern Nigeria were described by John B. Appleton. Three papers on climate and meteorology were presented by: Anna Marie Boschen, on a modification of the Koppen criteria for determining seasonal distribution of rainfall; by Malcolm H. Bissell, on variation in the warmest temperatures in the United States; and by R. W. Richardson, on winter air mass convergence in the north Pacific area. The program ended with three papers on geography teaching. H. W. Fairbanks urged the need for a harmonious and aggressive front on the part of school geographers; J. F. Chamberlain gave the results of a study on geography in the secondary schools of the Pacific Coast states, and Vinnie B. Clark described field work as carried on in the State Teachers College at San Diego with freshman geography classes.

OCEANOGRAPHIC SOCIETY OF THE PACIFIC

On Friday, June 28, a luncheon was held, Dr. T. Wayland Vaughan presiding, under the joint auspices of the Committees on the Oceanography of the Pacific for the United States and for Canada. About sixty persons were present. The organization of the Oceanographic Society of the Pacific was completed at that time and the following officers were elected: *President,* T. Wayland Vaughan, Scripps Institution of Oceanography, University of California; *vice-president,* C. McLean Fraser, University of British Columbia; *secretary-treasurer,* C. L. Utterback, Oceanographic Laboratories, University of Washington; *members at large,* Beno Gutenberg, Seismological Laboratory, Carnegie Institution of Washington and California Institute of Technology, and W. L. Scofield, California Fisheries Laboratory, Terminal Island.

After the business had been disposed of, a program of communications on oceanographic subjects was presented as follows:

Oceanographic activities on the Pacific Coast of Canada: A. H. HUTCHINSON, University of British Columbia.

Oceanographic work of the U. S. Navy in the Pacific: LT. COMMDR. A. W. BROWN, U. S. Hydrographic Office, San Pedro.

Work of the U. S. Coast and Geodetic Survey in the Pacific: COMMDR. O. W. SWAINSON, U. S. Coast and Geodetic Survey.

Ocean waves: BENO GUTENBERG, California Institute of Technology.

California shoreline phenomena: J. P. BUWALDA, California Institute of Technology.

Studies of old hydrographic charts of California har-

bors with reference to shoreline changes: U. S. GRANT, University of California at Los Angeles.

Marine terraces of the California coast: WM. C. PUTNAM, Los Angeles Junior College.

Research in biology at the Oceanographic Laboratories of the University of Washington: R. C. MILLER.

Research in physical oceanography at the Oceanographic Laboratories, University of Washington: C. L. UTTERBACK.

Marine research, California Fish and Game Commission: W. L. SCOFIELD, Director, State Fisheries Laboratory, Terminal Island.

Research at the Marine Laboratory, California Institute of Technology, at Corona del Mar: G. E. MACGINITIE.

General oceanographic announcements and work of the Scripps Institution: T. W. VAUGHAN.

BUSINESS SESSIONS

Sessions of the executive committee were held on Tuesday, Wednesday and Thursday. In addition to routine matters immediately relevant to the arrangements and progress of the meetings, several items of more general interest were transacted.

Richard Chase Tolman, professor of physical chemistry and mathematical physics at the California Institute of Technology, was elected president of the division for the year 1935–36.

The requisite subcommittees for organizing the program of the 1936 meeting were established. This meeting will be held at the University of Washington, Seattle, in June, 1936. Dr. A. F. Carpenter will serve as chairman of the general committee in charge of the local arrangements.

A complete revision of the constitution under which the Pacific Division functions was ordered. The present constitution was adopted in 1916 and with numerous amendments has served effectively to the present time. The growth of the association on the Pacific Coast and in the western states, substantial increases in the number of affiliated societies and the inevitable expansion in the programs of our annual meetings have combined to render necessary a thorough inquiry into the machinery of organization to permit the division to serve most effectively in coordinating the activities of its associated societies.

At the general business session of the division held on June 26, the following were elected to the executive committee in succession to the retiring members, A. O. Leuschner, J. H. C. Smith and O. F. Stafford: Bennett M. Allen, professor of biology at the University of California at Los Angeles; Calvin P. Stone, professor of psychology, Stanford University; Thomas G. Thompson, director of the Oceanographic Laboratories, University of Washington.

The following schedule of future meetings was announced:

1936, Seattle.
1937, Denver (national meeting).
1938, Bay Region (tentative).
1939, Southern California (tentative).

This report of the Los Angeles meeting would be quite incomplete without recording the appreciation of members for the hospitality which was enjoyed. To the formal resolution of gratitude transmitted to the administrative authorities of the university, to the Los Angeles Chamber of Commerce and to the local committees in charge of arrangements it would be fitting to add an informal word of appreciation for the many unofficial courtesies which were extended and for the friendly environment of the meetings.

The General Committee in charge of local arrangements consisted of S. J. Barnett, *chairman,* B. M. Allen, L. E. Dodd, F. C. Leonard, *secretary,* D. G. Maclise, W. J. Miller, E. C. Moore, W. C. Morgan, Paul Perigord, H. M. Showman, E. K. Soper and O. L. Sponsler.

OBITUARY

CURTIS FLETCHER MARBUT

THE foremost authority on the soils of the world died of pneumonia while virtually alone in Harbin, Manchukuo, on August 25. No single individual has contributed more to soil science or been more important to American agriculture than Dr. C. F. Marbut. His untimely death overtook him en route to China, where he was to complete his examination of the soils of Asia at the request of the Chinese Government. He had planned to make a trip into India and then return to Rome, there to compile a soil map of the world for the International Institute of Agriculture.

Dr. Marbut was born on a farm in Lawrence County of the Missouri Ozarks on July 19, 1863. Short-term rural schools and intimate contact with an intensely rural community gave sufficient opportunity for his insatiable mind to develop early those habits of steady, honest inquiry which characterized all his scientific work and his way of life. Never, for any reason, could he be persuaded to deviate one iota from the path of scientific truth, regardless of where it led. After a brief period of teaching in the local rural schools and preparing himself for college he entered the University of Missouri, from which he graduated in 1889. A year later he was made a member of the State Geological Survey, and in 1893 went to Harvard University, receiving the master's degree in 1894. From 1895 to 1910 he taught geology in the Univer-

sity of Missouri first as instructor, then as assistant professor and as professor for the last eleven years. During 1899 and 1900 he traveled through Europe, studying land forms and geology. From that time to the day of his death he took every opportunity to extend his knowledge of geography and soils through travel. He made several subsequent trips to Europe and through South America, Canada and Mexico. There is scarcely a county in the United States in which Dr. Marbut has not made personal investigations of the soils and agriculture.

His first interest in soil science began in 1909, when he was appointed as cooperative agent in the Bureau of Soils of the U. S. Department of Agriculture. At the request of Professor Milton Whitney, then chief of the Bureau of Soils, he left the University of Missouri in 1910 to take charge of the Soil Survey Division, which had already been initiated by Professor Whitney some years earlier. In this position he directed the soil survey work in the United States, and made it one of the outstanding scientific enterprises of the nation, to say nothing of the great impetus he gave to soil research in other nations.

Early soil investigations in western Europe and the United States had been made almost entirely by agronomists interested in problems of plant growth from the experimental point of view. Having a broad training in geology and geography, Dr. Marbut early conceived of soil types as geographic entities to be studied as individuals and in relation to the landscape as a whole. These types were dynamic and evolutionary products produced not by, but with, the other phases of the landscape. He visualized the necessity of an exact knowledge of these soil entities, which knowledge might serve as the necessary ground work for studies of their capabilities for use and their response to management. Fortunately for American agriculture, his views have prevailed to the extent that there is now a large part of this essential information available.

Meanwhile there had been developing in Russia a strong school of soil science, but due to the barrier of languages this work was relatively little known to American and western European workers until the publication of K. D. Glinka's *Die Typen der Bodenbildung* in 1914. Dr. Marbut read this book and was so impressed by it that he translated it into English in order that it might be more readily available to American workers.

The Russian system of soil classification, based largely upon climatic régimes, was by no means directly applicable to American soils; yet the stimulation of the new points of view and the new methods was enormous. Although Dr. Marbut was insisting that the soils themselves must be studied, the Russian work had firmly established two principles: (1) The importance of the soil profile as a distinct entity; and (2) the principle of soil geographicity.

Although Dr. Marbut keenly realized the great advances made by Glinka and his coworkers, using climate as a basis for outlining great soil regions, he held his own work strictly to the inductive method. He was constantly admonishing his followers: "Describe the soils as you find them. Get the facts first and philosophize about the genesis of the soil later. Soils must be studied and classified as soils, not as geological products, climatic products or from the point of view of anything outside the soil itself." This all seems so logical now that it is hard to understand why there was ever a question, but new ideas seem frequently to meet an initial resistance.

To appreciate the work of Dr. Marbut one must realize that although there was much information regarding soils in the United States when he came into the Department of Agriculture, the data were isolated and scattered. There was no systematic body of knowledge and consequently no soil science. The early soil survey was more or less based on the geology of the underlying rocks, together with such additional factors as relief and drainage. But not until the soils themselves were studied could there be any great progress. His great contribution was the development of a system wherein these facts and data had meaning and significance. Years will be spent in perfecting the system, in correcting errors and in extending it, but its principal features are fundamental and enduring. In a large measure Dr. Marbut achieved for soil science what Darwin achieved for biology—he made a rational whole from scattered, seemingly unrelated facts.

He received his LL.D. degree from the University of Missouri in 1916. He held membership and honorary membership in a great many geographical, pedological and other scientific societies both here and abroad. The American Geographical Society awarded him the coveted Cullum Medal in 1930: "For his geographical work on the soil, 'the foothold of all things.'" For several years he was president of the Fifth Commission of the International Society of Soil Science, dealing with problems of soil morphology, genesis and classification. He had just presided over the meetings of the commission at the International Congress of Soil Science held in Oxford, England, during the early part of August.

Dr. Marbut published several books and papers dealing with various aspects of soil science. Advanced copies of his most recent and important work, "The Soils of the United States," were placed in his hands only last July. This work forms the last and final section of the "Atlas of American Agriculture," and includes a large colored map on a scale of forty miles to

the inch of the two hundred and fifty important groups of soils in the United States. Accompanying the large map are others showing particular details and an exhaustive text summarizing what is known regarding the morphology and genesis of the soils.

Although his work by itself is of the utmost significance and importance and will live for many years to come, perhaps his greatest influence has been exerted by more subtle means. Never did a man better exemplify the ideal scientific spirit through his whole being than Dr. Marbut. This attitude of steadfast devotion to scientific truth and freedom from prejudice was coupled with a modest, kindly personality that inspired all those fortunate enough to know him. The effect of this stimulation has permeated the whole science and been an inspiration to young men, not only in America, but throughout the world.

He married Florence L. Martin on December 17, 1891, and three sons and two daughters were born to them. Mrs. Marbut died in 1908, but his children all survive him.

CHARLES E. KELLOGG

RECENT DEATHS

DR. ALEXANDER CREVER ABBOTT, emeritus professor of hygiene and bacteriology at the University of Pennsylvania, died on September 11. He was seventy-five years of age.

WILLIAM MYNN THORNTON, professor emeritus of applied mathematics, formerly chairman of the faculty at the University of Virginia, died on September 11 at the age of eighty-four years.

OREL SAMUEL GRONER, since 1921 professor of chemistry at Bucknell University, Lewisburg, Pa., died on September 9. He was sixty-four years old.

DR. CHARLES NORRIS, chief medical examiner of New York City for the past eighteen years, previously from 1904 to 1918 director of the laboratories of Bellevue Hospital, known especially for his work in crime detection, died on September 11. He was sixty-seven years old.

THE death at the age of fifty-two years is announced of Lieutenant-Colonel Hugh William Acton, retired, for over eight years director of the School of Tropical Medicine, Calcutta, and of the Carmichael Hospital for Tropical Diseases.

The British Medical Journal records the death of Professor Manuel J. Rizzi, otorhinolaryngologist, of Buenos Aires, aged fifty-nine years; of Dr. Gustav Hauser, emeritus professor of general pathology and morbid anatomy at Erlangen, aged seventy-nine years, and of Dr. Adrien Bayet, professor of clinical dermatology at Brussels, aged seventy-one years.

SCIENTIFIC EVENTS

"CURRENT SCIENCE"

Current Science, "a monthly journal devoted to science," published at Bangalore, India, completed its third year in July and the management is making plans to issue the journal every two weeks. The journal is conducted on the general lines of *Nature* by a board of editors composed of Professor C. R. Narayan Rao, who is editor-in-chief, and Dr. V. Subrahmary, who is "joint editor." Dr. F. H. Gravely, Rau Bahadan and Professor Venkalesachu are members of the board and B. M. Sastri is secretary. They have the editorial cooperation of about fifty scientific men, residing in India and in England.

The articles in the first number of the fourth volume, which contains in addition editorials, original articles, letters to the editor, reviews, research and news notes, are:

"The Artificial Preparation of the Male Sex Hormone," Professor L. Ruzicka.

"Locust Research Work in India," Rao Sahib Y. Ramachandra Rao.

"Gaps in Our Knowledge of the Indian Protozoa. I. Ciliophora," B. L. Bhatia.

"Mining and Geological Institute of India."

"Insect Transmission of Spike Disease of Sandal (*Santalum album* Linn.)," S. Rangaswami and M. Sreenivasaya.

"Chemistry in the Customs Department," H. B. Dunnicliff.

"Some Biochemical Factors of Disease Resistance in Plants," A. V. Varadaraja Iyengar.

The first number of a second monthly journal, *Science and Culture*, was issued in July, the objects of which are given as follows: (*a*) Authoritative articles written in non-technical language on all scientific matters of general interest. (*b*) Short articles. (*c*) Short notices of original work and suggestions regarding matters of scientific interest. (*d*) News of interest to the scientific workers particularly from universities and learned societies.

In an editorial of welcome to the new journal *Current Science* writes in part:

We have pleasure in offering a warm welcome to *Science and Culture*, a new monthly journal of natural and cultural sciences, whose aim is to promote the cause of science by spreading scientific knowledge among the public. It is further explained that publication is promoted by a non-profit corporation of "some eminent scientists and

educationists of India,'' whose identity will doubtless be revealed in a subsequent issue. . . . Some aspects of *Science and Culture* are so similar to the corresponding features of *Current Science* that we confess to misgiving that its promoters have judged us and found us wanting. Actually, there is very little of the material presented in this first issue for which we would not gladly have found space in our own columns. The question therefore arises in our mind, is there a large enough public for two similar journals; because, if not, we fear that both must languish, under-nourished in both material and support. On the other hand, there is ample room for a journal popularizing science, old and new. Therefore, while welcoming *Science and Culture* we take leave to hope that future issues may devote themselves more definitely to the declared policy of its promoters, and expand on lines complementary to—rather than competitive with—*Current Science*.

THE PEAT SUBCOMMISSION OF THE THIRD INTERNATIONAL CONGRESS OF SOIL SCIENCE

DURING the session of the Peat Subcommission of the third International Congress of Soil Science, held at Oxford, England, it was proposed that the attention of workers should be directed to three main issues:

(1) The Classification of Moorland.
(2) The Draining and Subsidence of Moorland.
(3) The Liming and Manuring of Peat Soils.

It was decided that these subjects should form the basis for discussions to be held in Sweden in July, 1937, and that the scope of the work should be extended before the meeting of the next international congress, which will be held in Germany in 1940.

To enable a satisfactory program of work to be carried out, it was recommended that the president be assisted by six vice-presidents and a regional committee. The latter will include members from the various countries interested in moorland problems and it will be the duty of each member to form a link between the commission and the workers in his country.

The following office bearers were elected:

Honorary President, Geheimrat Professor Dr. B. Tacke, Germany.
President, Dr. F. Brüne, Germany.
Secretary, Professor L. Rinne, Esthonia.
Vice-Presidents, Dr. A. P. Dachnowski-Stokes, U. S. A.; Dr. I. P. Gerasimov, U. S. S. R.; Direktor E. A. Malm, Finland; Dr. W. G. Ogg, Scotland; Professor H. Osvald, Sweden; Dr. J. Tomaszewski, Poland.

Regional Committee

Canada, Professor R. R. McKibbin; Czechoslovakia, Ing. Dittrich; Denmark, Dr. K. Jessen; Esthonia, Professor L. Rinne; Finland, Direktor E. A. Malm; Germany, Professor Mayer; Great Britain, Dr. I. M. Robertson; Holland, Professor Elema; Ireland, ————; Norway, Dr. A. Loddesel; Poland, Dr. B. Swietochowski; Sweden, Professor H. Osvald; U.S.A., Dr. F. J. Alway; U.S.S.R., Dr. Varlygin.

THE WASHINGTON MEETING OF THE ELECTROCHEMICAL SOCIETY

THE autumn meeting of the Electrochemical Society will be held in Washington on October 10, 11 and 12, under the presidency of James H. Critchett, of the Electrometallurgical Company. Headquarters will be at the New Willard Hotel. The preliminary program describes the general plans for the meeting.

The Local Committee, headed by Dr. George W. Vinal, of the Bureau of Standards, has planned visits to various laboratories for Thursday afternoon. Of particular interest to students of high temperature will be the Geophysical Laboratories in Washington, where Dr. L. H. Adams and others have succeeded in reproducing conditions which prevailed in the earth's crust ages ago, and have produced a series of well-known minerals synthetically.

On Thursday evening there will be a dinner in honor of Frank J. Tone, president of the Carborundum Company, recipient of the fourth Edward Goodrich Acheson Medal, in recognition of his outstanding work on the electric furnace. The presentation of the medal and prize will take place immediately after the dinner. Dr. Frederick M. Becket, president of the Electrometallurgical Company and head of the Union Carbide Research Laboratories, will speak on the scientific and technical accomplishments of the medallist and Dr. Carl G. Schluederberg, manager of the Cleveland and Indianapolis Works of the Westinghouse Company, on "Tone the Man." Then will follow the presentation of the medal, and the speech of acceptance by Mr. Tone.

Dr. George W. Vinal will preside at the session devoted to recent developments in the battery art on Friday morning. Friday afternoon will be devoted to visits to the Bureau of Engraving and Printing, the Food Laboratories, the Bureau of Standards and others. In the evening there will be a joint meeting with the other scientific and engineering societies of Washington in the large ball room of the New Willard Hotel. Dr. C. E. K. Mees, director of the Research Laboratories of the Eastman Kodak Company of Rochester, will be the guest speaker. He will describe the new Kodachrome process which is making it possible for every amateur to take colored photographs. Afterwards a visit is planned to the United States Naval Observatory.

The Electrodeposition Division, W. W. McCord, chairman, has arranged for a session for Saturday morning, and probably part of the afternoon, October 12.

Besides the three main sessions enumerated above, there will be a session devoted to a group of papers on various phases of electrochemistry. Stender and his associates (Leningrad, Russia) will discuss the Castner cell; Krause and Kahlenberg (University of Wisconsin), the palladium-hydrogen equilibrium; Lilienfeld, Nieh and Goldman (of Malden, Mass.), anodic layers on aluminum.

Dr. Colin G. Fink, Columbia University, New York City, is secretary of the society.

CHANGES AT THE FRANKLIN INSTITUTE

NATHAN HAYWARD, president of the Franklin Institute, Philadelphia, Pa., has announced the election of Henry Butler Allen, metallurgist of the Henry Disston Company, Philadelphia, and member of the Board of Managers of the Franklin Institute for several years, as director of the museum of the institute. He will take up his new work on October 1.

Dr. Howard McClenahan has been granted a year's leave of absence and plans to travel for a year, after which he will continue his services as secretary of the institute, a position that he accepted in 1925 when he retired as dean of the College of Princeton University. Under his leadership the Franklin Institute, together with the Benjamin Franklin Memorial, Inc., conducted a drive for funds for a new building. Work was begun in 1930 and the building completed and occupied in the fall of 1933. Shortly after his acceptance of the secretaryship he proposed this expansion and was sent abroad by the officials of the institute to study the Deutsches Museum in Munich. As a result of his efforts the scientific and technological museum was sponsored by the institute. One of its best known features is the planetarium, the gift of Samuel S. Fels. In Dr. McClenahan's absence Dr. Alfred Rigling, librarian and assistant secretary, will carry on his work.

Mr. Allen's connection with the Franklin Institute began when he became a member in 1916. He has served as chairman of the Committee on Science and the Arts, and in 1932 was elected a member of the Board of Managers. He has been chairman of the Museum Committee for the past two years. Mr. Allen, who was born in Greenfield, Mass., attended New England schools and Amherst in the class of 1909. He received a degree of metallurgical engineer from the Columbia University School of Mines in 1911. For a short time thereafter he was United States Examiner of Iron and Steel for the Port of New York. In 1913 he became associated with Henry Disston Sons Company, of Philadelphia, and has continued with them ever since, being now chief metallurgist of the company. Mr. Allen returned recently from a six-week trip to Europe, where he visited museums as well as industrial plants.

SCIENTIFIC NOTES AND NEWS

SIR JOSIAH STAMP was elected president of the British Association for the Advancement of Science at the recent meeting at Norwich. Sir Josiah is chairman of the London, Midland and Scottish Railway, director of the Bank of England and a member of the British Economic Advisory Council.

AT the annual meeting of the American Astronomical Society, held at Toronto on September 10, 11 and 12, under the presidency of Dr. Henry Norris Russell, of Princeton University, the following officers were elected: Dr. Frederick Slocum, of the Van Vleck Observatory at Wesleyan University, *vice-president;* Dr. Annie Jump Cannon, of Harvard College Observatory; Dr. Robert H. Baker, of the University of Illinois, and Dr. Theodore Dunham, Jr., of the Mount Wilson Observatory, *councilors;* Dr. Robert G. Aitken, director emeritus of the Lick Observatory, was appointed the society's representative on the National Research Council. Dr. R. S. Dugan, of Princeton University, *secretary,* and Dr. F. C. Jordan, of Allegheny Observatory, *treasurer,* were reelected. Dr. Ejnar Hertzsprung, director of the Sterrewacht at Leiden, Holland, was elected to honorary membership to succeed the late Dr. Willem de Sitter.

A DINNER in honor of Dr. Gilbert N. Lewis, professor of physical chemistry and dean of the College of Chemistry of the University of California, was given by the American Chemical Society at the close of the San Francisco meeting.

PRESENTATION will be made of the Frederic Ives Medal for 1935 to Dr. George Ellery Hale, honorary director of the Mount Wilson Observatory of the Carnegie Institution, at the annual dinner of the Optical Society of America, which meets at the Franklin Institute, Philadelphia, from October 24 to 26. Dr. Charles G. Abbot, secretary of the Smithsonian Institution, will accept the medal on behalf of Dr. Hale.

THE Albert Medal for 1935 of the Royal Society of Arts, London, given annually "for distinguished merit in promoting arts, manufactures or commerce," has been awarded to Sir Robert Hadfield "for his researches in metallurgy and his services to the steel industry."

Nature states that the council of the Royal Society of Edinburgh has awarded the Makdougall-Brisbane Prize for the period 1932–34 to Dr. A. E. Cameron, lecturer in entomology at the University of Edinburgh, for his publications in entomology.

THE Vienna Academy of Sciences has awarded the Ignaz-L. Lieben prize to Dr. Armin Dadieu, professor of physical chemistry at Graz; the Haitinger prize to Dr. Josef Mattauch, privatdocent in physics at Vienna; the Rudolf-Wegscheider prize to Dr. Wolfgang Leithe, privatdocent in organic chemistry at Vienna, and the Fritz Pregl prize for micro-chemistry to Dr. Edgar Schally, of Graz.

AT the University of Virginia, Dr. Edward James McShane has been appointed professor of mathematics; Dr. Eller C. Howe, of New Mexico, associate professor of engineering, and Chapin Jones, associate professor of forestry.

LEWIS VAN CARPENTER, professor of sanitary engineering and head of the department of civil engineering at West Virginia University, has been appointed associate professor of sanitary engineering in the New York University College of Engineering, and John K. Vennard, of the Massachusetts Institute of Technology, has been appointed instructor in hydraulics.

AT the Iowa State College, Professor John Tipton Lonsdale, of the Texas Agricultural and Mechanical College, has been appointed head of the department of geology, and Professor Mervin S. Coover, of the University of Colorado, head of the department of electrical engineering; Dr. E. L. McMillen, formerly of the University of Minnesota and of Lehigh University, has been made assistant professor of chemical engineering, and Dr. A. M. Lucas has been appointed professor of zoology.

AT the School of Medicine of the University of Alabama, Dr. Cornelius S. Haggerty, of Rush Medical College, has been appointed assistant professor of pathology and bacteriology, replacing Dr. Gene H. Kistler, who has accepted a surgical appointment at the Lahey Clinic in Boston. Dr. Herbert K. Fidler, of Indiana, has been appointed instructor in pathology and bacteriology, and Dr. Snowden C. Hall, Jr., of Duke University School of Medicine, instructor in physiological chemistry and physical diagnosis. Dr. Hall replaces Dr. J. Lamar Callaway, who has accepted a fellowship in dermatology under Dr. John H. Stokes, of the University of Pennsylvania.

J. F. CRAIG, principal of the Veterinary College of Ireland, has been appointed to the William Prescott chair of the "Care of Animals—Causation and Prevention of Disease," at the University of Liverpool, in succession to the late Professor S. H. Gaiger.

THOMAS BERTRAND ABELL, professor of naval architecture and dean of the faculty of engineering of the University of Liverpool, has been appointed pro-vice-chancellor of the university for the year 1935–36.

DR. ALLEN D. KELLER, professor of physiology and pharmacology at the School of Medicine of the University of Alabama, has received a grant of three thousand dollars from the Rockefeller Foundation, to be spent in carrying on a program of experimental work on the central nervous system on which he has been engaged for several years.

DR. A. S. HAZZARD has resigned his position as associate aquatic biologist in the U. S. Bureau of Fisheries, under which he has been in charge of research for the bureau in the Intermountain Region, to become director of the Institute for Fisheries Research, supported at the University of Michigan by the Michigan Department of Conservation.

DR. J. L. WEIMER, plant pathologist for the U. S. Department of Agriculture, who has been investigating the diseases of alfalfa in California for the past several years, has been transferred to the Georgia Experiment Station, Experiment, where he will study the diseases of green manure crops, paying special attention to Austrian winter peas and vetches.

COLONEL H. H. A. EMERSON, commandant and chief instructor at the British Army School of Hygiene, Aldershot, has been selected director of hygiene at the War Office, in succession to Major-General P. H. Henderson, who will retire on completion of four years' service as a major-general.

DR. E. D. ADRIAN, Foulerton professor of physiology of the Royal Society, succeeds Sir Charles Sherrington as a member of the Advisory Board of the Beit Memorial Trust. The trustees accepted with regret the resignation of Sir Charles, who had served for twenty-four years.

DR. JESSE D. FIGGINS, director of the Colorado Museum of Natural History, has been called in as consultant in the construction of a museum at Dallas, Texas, which is to be erected at a cost of $200,000.

DR. WILLET F. WHITMORE, professor of chemical microscopy and organic chemistry at the Brooklyn Polytechnic Institute, has resigned as a member of the Amityville, L. I., Board of Education, on which he has served for eight years.

W. W. YOTHERS, Orlando, Fla., entomologist of the U. S. Department of Agriculture, has retired after thirty years of service. He will engage in commercial work, supervising pest control for individuals, firms, associations and corporations. He will also act as referee in cases of dispute in all matters pertaining to citrus fruit production.

DR. JOHN E. YOUNGER, professor of mechanical engineering in the University of California, has been granted a year's leave of absence, as special investigator for the army to conduct research in the Research

and Development Laboratory of the United States Air Corps, Dayton, Ohio.

DR. W. H. ADOLPH, professor of biochemistry at Yenching University, Peiping, China, has been granted leave of absence for the academic year 1935–36, and will be engaged in research work at Yale University.

DR. ROBERT S. PLATT, of the department of geography of the University of Chicago, left on September 9 for a six-months airplane field trip through northern South America. He expected to start on September 12 from Miami for British Guiana and to continue along the east coast of Brazil, then by boat up the Amazon River. The Andes will be surveyed from the plane, and the trip will be finished by a study of Peru, Ecuador and Panama.

DR. OTTO SAVISON has been appointed Tweedie fellow of the University of Edinburgh for two years. This fellowship is awarded to enable the holder to carry out exploration and research in the less known regions of Asia and northern Africa. Dr. Savison was formerly head of the East Asiatic Section of the Ethnographical Museum in Hamburg, holding the post until 1933. In 1931 and 1932 he traveled in China to collect ethnographical specimens for the museum. He will study the extent and direction of the influences of China upon India and *vice versa,* planning to live in villages near the borders of India.

A PARTY of naturalists, led by Professor J. W. Heslop Harrison, professor of botany at Armstrong College, University of Durham, recently returned to Newcastle after making a survey of the flora and insect life of four small Hebridean Islands. Much of the ground had not previously been covered, and as a result of their work the known range of British plants has been increased. Numerous specimens of plant and animal life on the islands were collected.

THE Division of Medical Sciences of the National Research Council will hold a special meeting in November for the consideration of applications for grants in this field. Applications must be on file with the secretary of the Committee on Grants-in-Aid, Dr. Clarence J. West, not later than October 1. Applications received after October 1 and prior to February 15, 1936, will be acted upon at the next regular meeting of the Committee on Grants-in-Aid in March, 1936.

AT the San Francisco meeting of the American Chemical Society it was voted to accept the invitation of the section at Rochester, N. Y., to hold there the autumn meeting in 1937, when the twenty-fifth anniversary of the founding of the section will be celebrated. On the recommendation of the Committee on Policy of the Council it was voted to hold the autumn meeting of 1938 in the region of Wisconsin and Minnesota. The spring meeting of that year will be held in the region of Oklahoma and Texas.

THE eighth annual meeting of the Committee on Electrical Insulation, Division of Engineering and Industrial Research, National Research Council, will be held at Pittsfield, Mass., on October 17, 18 and 19, with the General Electric Company as host. The technical program is in three sessions in which twenty papers in the field of dielectric research and its applications to the problems of electrical insulation will be presented. Dr. J. B. Whitehead, of the Johns Hopkins University, Baltimore, Md., is chairman of the committee, and W. F. Davidson, of the Brooklyn Edison Company, Brooklyn, N. Y., is secretary.

ACCORDING to *The Museum News,* the Museums Association of China was organized at a meeting held last May at the Palace Museum, Peiping. More than sixty museum workers attended. Ma Heng, director of the Palace Museum, was elected chairman and T. L. Yuan, director of the National Library, secretary-treasurer. Headquarters have been established at 3 Chih Shan Men Ta Chieh, Peiping. The association is sponsoring an exhibition illustrating museum architecture and equipment in Europe and America, which was shown at the Jade Budda Pavilion in May and will be circuited to other cities in China. The program of the association includes the publication of a directory of Chinese museums and a bimonthly bulletin. Also a reference library will be maintained as a center of information about museums and museum technique. In order to introduce western methods into Chinese museums the Museums Association of China is endeavoring to increase as rapidly as possible its collection of books, pamphlets and periodicals dealing with museum work in all its phases, including especially material from American sources.

AN appropriation of $5,000,000 for the Graduate School of the University of Michigan has been made by the Horace H. Rackham and Mary A. Rackham Fund of Detroit. The grant supplements many anonymous gifts which Mr. Rackham made to the institution during his lifetime. One million dollars will be used to construct an independent building for the Graduate School, on an area a block square, while the balance will become a perpetual endowment for the school.

APPLICATIONS must be on file with the U. S. Civil Service Commission at Washington, D. C., not later than September 30 for an open competitive examination for the position of senior safety engineer for the Division of Labor Standards, Department of Labor, at a salary of $4,600 a year. Applications must also be on file for the positions of physio-therapy aide and pupil aide at salaries, respectively, of $1,800 and $1,440, annually.

FIVE members of the Andes-Amazon expedition, 1935–1936, sponsored by the Museum of the American Indian (Heye Foundation), sailed on August 10 for Ecuador, under the leadership of Captain Eric Erskine Loch. Others will meet them in Ecuador. The expedition, whose chief purpose is to study the Ssabela Indians in the Upper Amazon Valley and bring back ethnological specimens to the museum, will remain in the field a year.

To promote the study and work in the field of theoretical biology a foundation for theoretical biology of animal and man has been founded at the University of Leiden. In memory of the late professor of zoology Van der Hoeven (1801–1868), the author of the "Philosophia zoologica," it is called "Professor Dr. Jan van der Hoeven Stichting voor theoretische biologie van dier en mensch." The chief objects of the foundation are: (1) to arrange for lectures at the University of Leiden; (2) to bring the Leiden biologists who are interested in theoretical biology into contact with their colleagues in Holland and abroad; to bring about a contact for scientific purposes and organizations between theoretical biologists all over the world, for instance, by arranging international symposia on theoretical biology; (3) to publish articles on theoretical biology; (4) to found a library on this subject. Directors of this foundation are: Dr. C. J. van der Klaauw, professor of general zoology, and Dr. J. A. J. Barge, professor of medical anatomy, both at Leiden, and Dr. Adolf Meyer, professor of theoretical biology at Hamburg.

THE *Journal* of the American Medical Association states that Dr. Desfosses, editor of the *Presse médicale,* has published statistics on a subject that has caused agitation in France. In 1935 there are 10,148 French and 3,021 foreign students in the various medical schools; hence more than a fourth of the total number of 13,169 are foreigners. Ten thousand French students are far more than are necessary to fill the needs for medical men in France and its colonies. Some foreign countries, like Poland, now refuse to allow students to return to their native land to practise, and the same will soon be true of other countries that will not recognize a French diploma. The only method to decrease the plethora in the medical profession lies in the Portmann law, which aims to eliminate students during the first two years who can not attain a certain grade in their examinations and who have not had sufficient preliminary training.

A WAR DEPARTMENT request for $2,000,000 to map areas along the coasts and borders "which will become of high strategic importance in war" was announced recently by the works applications division. The army mapping project would include about 37,440 square miles of new maps and revised maps for about 38,320 square miles of territory. It would call for reproduction of defense maps and be coordinated with work by the Geological Survey and the Coast and Geodetic Survey. The services of the Air Corps and army engineers would be utilized. The proposed mapping would be done in Arizona, California, Connecticut, Delaware, District of Columbia, Florida, Mississippi, Maine, Maryland, Massachusetts, Michigan, Montana, New Jersey, New Mexico, New York, North Carolina, Oregon, Rhode Island, South Carolina, Texas, Vermont, Wyoming and Wisconsin.

DISCUSSION

THE CIRCULATION OF HUDSON BAY WATER AS INDICATED BY DRIFT BOTTLES[1]

THE Hudson Bay Fisheries Expedition of 1930[2] released five hundred drift bottles in Hudson Bay in the hope that returns from these bottles would throw some light on the general circulation of the surface layer of the waters of the bay.

The drift bottle used consisted of an ordinary catsup bottle, to which was attached a metal drag. The metal drag, suspended by about three feet of galvanized wire, was intended to serve two purposes as follows: (1) To keep the bottle upright and almost wholly submerged, and (2) to cause the bottle to follow the movement of the upper three feet of water, rather than the movement of the immediate surface water. Postcards, asking information from the finders of the bottles, were placed within the bottles. Bits of red cloth were placed in the necks of the bottles as a means of attracting attention if, and when, the bottles were seen lying on the shore. The bottles were then sealed with waxed corks.

Five years have passed since these bottles were released, and to date (July, 1935) twenty-six cards have been returned, a surprisingly good return from

TABLE 1

Lot	Date of release	Number released	Number returned	Percentage returned
1	Aug. 6/30	102	none	0.0
2	Aug. 7/30	145	17	11.3
3	Aug. 19/30	154	5	3.4
4	Sept. 5/30	99	4	4.0

[1] Published with the permission of the Biological Board of Canada.

[2] H. B. Hachey, *Contr. Canad. Biol. and Fish.*, 6, 23: 465–471, 1931.

such a sparsely settled area. Particulars of these returns are given in Table 1.

The resultant drifts of these bottles, with the assumed general movements, are indicated in Figs. 1

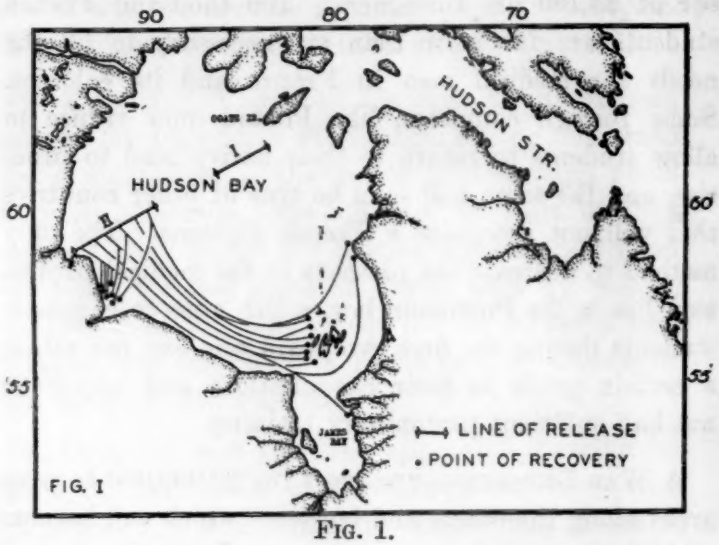

FIG. 1.

and 2. The returns from Lot 2 (Fig. 1) indicate a southeasterly movement along the southwest coast of Hudson Bay. From James Bay, the tendency is seemingly for a northerly movement holding close to the eastern coast of Hudson Bay. In plotting the meager returns from Lots 3 and 4 (Fig. 2), the in-

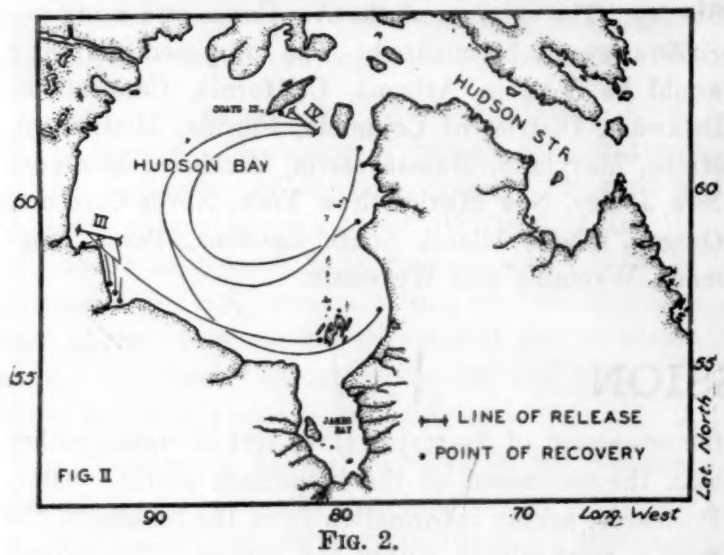

FIG. 2.

formation obtained from the returns of Lot 2 (Fig. 1) is taken into consideration. A northwesterly drift of the bottles is indicated by the one return from Coats Island. Consequently, the bottles of Lot 4 found along the east coast of Hudson Bay have probably made an almost complete circuit of the bay.

On the basis of this analysis of the returns, the general circulation of the surface waters of Hudson Bay would seem to be an anticlockwise one, with the outward movement of the waters from the James Bay area holding close to the eastern coast of Hudson Bay.

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THE ANTIGENIC PROPERTIES OF PLANT VIRUSES

THE application of serological methods to plant viruses has aroused considerable interest among pathologists, and recently several workers have presented the results of experiments which were planned to demonstrate that the active antigens are the viruses and not some other constituent of the plant. One of the most recent papers is that of Chester,[1] who has approached the problem from several angles. While Chester's general conclusion appears to be justified, the method used for presenting some of his data and likewise some of his reasoning can not be followed.

In Fig. 1 of his paper are presented line graphs showing the effect of temperature on four different viruses obtained from Turkish tobacco. The effect of temperature on the viruses was determined: (1) by the number of necrotic lesions or by the number of infected plants produced by the heated viruses and (2) by the precipitin reactions.

The writer was struck with the fact that the datum points for the infectivity of the unheated virus controls and for the seric reactions of these same controls coincide in the case of two viruses and are very close together in the case of the other two viruses used. This seemed to be phenomenal, since the actual number of lesions and the number of systemically infected plants produced by a given virus with a given species of plant is dependent on several factors other than the virus. If more or fewer leaves or larger or smaller leaves had been wiped the actual number of lesions would have been greater or less than indicated in the graphs. Likewise, the number of systemically infected plants would be reduced or increased in accordance with the number of plants inoculated and the technique used. Furthermore, the actual number of lesions is influenced by slight differences in technique and environmental conditions. Owing to the variations in all the quantitative virus infectivity methods now in use, it would be extremely difficult to plan quantitative tests in a manner to insure obtaining a prearranged number of local lesions or of systemically infected plants. It appeared, therefore, that suitable factors had been employed for the purpose of bringing the infectivity curves in close proximity to their respective seric-activity curves, though this point is not made clear in the paper.

Examination of the graphs in question shows that each of the vertical scales presumably is plotted on a logarithmic basis. However, on closer examination it is found that the infectivity scale is not truly logarithmic throughout, the upper end being abnormally compressed in relation to the lower portion. On

[1] K. Starr Chester, *Phytopathology*, 25: 702–714. 1935.

the other hand, the precipitin dilution scale is uniformly logarithmic throughout.

Since none of the data were presented in numerical form it was very difficult to determine the infectivity data from the graphs, especially in the distorted portion. However, close estimates were obtained, and these together with the seric-reaction data were replotted on standard semi-logarithmic paper. In the tobacco mosaic and tobacco ringspot, it was found that the datum points for infectivity and seric reaction of the unheated viruses do not coincide, the points for the virus of tobacco mosaic showing an especially marked departure.

Chester calls especial attention to the fact that his curves for the seric inactivation and infectivity nearly coincide for each virus, but this curve proximity is accentuated through the use of the logarithmic scale which compresses increasingly as the data increase in magnitude. By plotting these data on plain graph paper this relationship is much less striking, especially in those curves in the upper portion of the figure.

For purposes of interpreting the antigenic nature of a virus it seems apparent that the infectivity and the seric-reaction end points are of much greater significance than the other points on these curves. These end points seem to be close in the case of each virus given the temperature treatments. It appears also that these end points were close when the viruses were treated with chemicals.

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DIVISION OF CEREAL CROPS AND DISEASES
U. S. DEPARTMENT OF AGRICULTURE

CLEAVAGE WITHOUT NUCLEI

WHEN unfertilized *Arbacia* eggs are centrifuged for four minutes at 10,000 X gravity in a sucrose solution isosmotic and of the same density as the eggs, so as to keep them suspended, they break into two nearly equal parts.[1,2] One of these parts is nucleated, *i.e.*, contains the female pronucleus, and the other is non-nucleated. This distribution is invariable; the nucleus always lies in the light half, under the oil cap. By treating the non-nucleate halves, which contain only yolk and pigment granules and the matrix or ground substance, with parthenogenetic agents, such as concentrated sea water, they throw off fertilization membranes. When transferred to sea water, cytasters soon appear, and after two hours cleavage planes appear in many of them. These divide the enucleate half-eggs sometimes into two equal cells, sometimes into two unequal cells and sometimes into three or four cells, equal or unequal. By subsequent cleavages, the enucleate half-eggs develop into blastulae, sometimes quite normal in appearance. Blastulae of approximately a hundred cells have developed from these activated enucleate half-eggs, though as yet no swimmers. Cleavage can therefore occur in eggs without either maternal or paternal nucleus. A full account of these parthenogenetic merogones with photographs will be published shortly.

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[1] E. N. Harvey, *Biol. Bull.*, 61: 273, 1931.
[2] E. B. Harvey, *Biol. Bull.*, 62: 155, 1932.

THE HATCHING OF EGGS OF THE SOUTHERN BUFFALO GNAT

IN the spring of 1927 and in other years since that time considerable numbers of farm animals, chiefly mules, have been killed in the lower Mississippi Valley by outbreaks of the Southern buffalo gnat (*Eusimulium pecuarum* Riley) (Simuliidae: Diptera). In former times this insect caused enormous losses of live stock in this region, but for some forty years prior to the present series of outbreaks, little was recorded concerning its depredations. That the sudden appearance of swarms of this pest is in some way dependent on spring floods has long been known, but the available information on the life history of the insect has failed to explain satisfactorily the phenomenon of this relationship.

After an investigation of the buffalo gnats that infest the lower Mississippi Valley, with special reference to *Eusimulium pecuarum*, Webster[1] stated that, so far as observed, the eggs of all the species dealt with hatch within a few hours, and the larvae live in the streams nearly an entire year before changing to pupae. The writer has for several years past made a careful search for young larvae of *E. pecuarum* in the gnat-producing rivers of Mississippi and Arkansas immediately after the spring outbreaks and also later in the summer.[2] During neither of these periods has he been able to find young larvae, although very small ones, which appeared to be *E. pecuarum*, were collected on November 22 and 23, 1932.

In April, 1934, several lots of eggs were obtained by confining gravid females of this species in jars over water. These jars were brought to the laboratory at Orlando, Fla., and were divided into two lots; one, in which the water was kept agitated and aerated by a continuous stream of air produced by a suction pump in a manner similar to that described by McCutcheon[3];

[1] F. M. Webster, U. S. Dept. Agric., 4th and 5th Annual Reports of B. A. I. for the years 1887 ad 1888; 456–465. 1889.
[2] G. H. Bradley, "Notes on the Southern Buffalo Gnat." (Accepted for publication in Proc. Ent. Soc. Wash.), 1935.
[3] F. Harold McCutcheon, SCIENCE, 76: 1975, 416–417, November 4, 1932.

the other, in which the jars were left undisturbed in the laboratory. The eggs were examined under low magnification occasionally during the following months, and up until November 5 no sign of larval development had appeared. Owing to the stress of other work further examination was not made until the middle of December, at which time large numbers of eggs in both the still and aerated jars contained fully formed larvae and some in each series were hatching.

It is apparent, therefore, that the eggs of *E. pecuarum* will hatch after spending the summer in a quiescent stage undergoing an incubation period of several months in either still or moving water. This finding offers an explanation for the fact that, in addition to the numbers of adults which emerge every spring from certain rivers, enormous numbers are produced during spring floods from the many "cutoffs," "bays" and lakes which are to be found in the lowlands of Mississippi and Arkansas and in which the water is quiet, except when adjacent rivers overflow. Since all *Simulium* larvae, so far as is known, require running water for their development, it appears that the long period which *E. pecuarum* spends in the egg stage is an adaptation for passing the several months during which a large part of its breeding places are likely to be unsuited for larval life. It seems probable that adult gnats are not produced from larvae coming from eggs which hatch in these quiet waters except in the event that a spring overflow occurs and keeps the waters in motion for a period sufficient to permit larval maturity. When such an overflow occurs, myriads of larvae may develop more or less simultaneously and give rise to swarms of adults, which under weather conditions favorable for their survival and migration cause large losses of farm animals.

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BIOLOGICAL CONTROL OF AN INSECT PEST BY A TOAD

IT is generally appreciated that many of the most destructive insect pests of any crop, in any country, are of foreign origin, inasmuch as in their migrations some at least of their natural enemies are left behind. Biological control of such introduced insect pests is therefore much more to be expected than the control of native insect pests by foreign natural enemies. The practical control of the native white grubs, the most serious and generally destructive insect pest of agricultural crops in Puerto Rico, by means of an introduced toad is therefore somewhat more notable and is perhaps the first authentic record of a foreign predator successfully reducing the numbers of an insect pest which is native to the country in which it was destructive. The foregoing statements and the history of the white grubs which follows are from no less an authority than Dr. George N. Wolcott, entomologist of the Insular Experiment Station of Puerto Rico.

The white grubs of Puerto Rico are larvae of large beetles of several species of the genus *Phyllophaga* (*Lachnosterna*); these species are found nowhere else in the West Indies or continent. In the mainland United States related species are known as May beetles or June bugs.

The rapid expansion of the sugar industry, following the change in governmental status of Puerto Rico in 1898, provided a continually more abundant food supply for these white grubs and also tended to eliminate many of their natural enemies such as owls and other large insectivorous birds. In some of the richest and otherwise most productive regions of the island, all the cane fields were more or less affected and cane harvesting often became a race to see if the stalks could be gathered before the grubs had completely destroyed all the roots.

Attempting to control the pest, an expensive method of hand collecting the grubs and beetles was first used. On one property during six years approximately 12,000,000 beetles were collected and an equal number of grubs. Other methods of artificial control were tried, such as dynamiting the fields, maintaining a herd of pigs to follow the plow and eat the grubs and by applying various chemicals. Also attempts were made to introduce insect parasites of other species of grubs from other countries, but all resulted in failure.

The first importation of the Surinam toad, *Bufo marinus* L., from Barbados, was made in 1920 by the Puerto Rico Experiment Station of the U. S. Department of Agriculture to combat these white grubs. In the winter of 1923–24 R. Menéndez Ramos, director of the Insular Experiment Station, brought in 40 additional individuals from Jamaica.

Bufo marinus is comparatively large, averaging 6 inches in length and is more than double the size of the ordinary American toad. It is venomous, but thousands have been collected by children for distribution without the venom being noticed. However, a dog seizing one in the mouth may receive a fatal dose of poison.

The first introductions were released on the station grounds at Mayaguez. A few years later they were being collected at the station and distributed to all parts of the island. Hundreds and thousands were carried from the station to the cane fields of the southern coast, where May beetles were most abundant and the toad could be of greatest value in reducing

the numbers of white grubs. From Puerto Rico these toads have now been sent to Louisiana and Hawaii, and from Hawaii they have been sent to the Philippines and Australia. Incidentally some of these toads were taken from Puerto Rico to Mauritius by one of their entomologists, but the authorities there would not allow them to enter.

An important contribution has been made by Mrs. Raquel Dexter, of the University of Puerto Rico, in determining the contents of the alimentary tract of this toad. It was found that over a quarter of the food of the toad in cane fields consists of May beetles and another eighth consists of large leaf-eating weevils or "vaquitas," the grubs of which are second only to the common white grubs in their destructive effect on roots of sugar cane. Only one fortieth of the food consisted of the changa or Puerto Rican mole cricket, a serious pest of tobacco and vegetables.

The status of the white grub in Puerto Rico has been changed from a major to a minor pest of sugar cane by the toad. In 1933 a foreign entomologist, studying the insect parasites of white grubs, had difficulty in obtaining a sufficient supply of them on which to rear large numbers of parasites in the laboratory. After a completely successful method of killing white grubs by chemical means (emulsion of carbon bisulfid) was found, the only opportunities for its use in Puerto Rico have been limited to small areas in pineapple plantations at elevations where the toad is even yet not present in sufficient abundance. So many reputed failures, or worse, in the past, have resulted from the introduction of predatory animals and birds, such as the English sparrow and the starling into the United States, and the mongoose from India into other parts of the tropics, that this decidedly beneficial introduction of a batrachian is worthy of record.

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SCIENTIFIC BOOKS

CHRONICA BOTANICA

Chronica Botanica. Edited by FR. VERDOORN. Editorial and Publishing Office, P. O. Box 8, Leiden, Netherlands. April, 1935. 447 pp. Price, 15 Netherl. guilders.

FEW persons, even those professionally engaged in the science, realize the extent and complexity of present-day botany. There is a distinct need for a periodic survey of this vast field, and it is such a survey that is attempted in "Chronica Botanica." The first volume of this periodical (for it is intended that it shall appear annually) has recently made its appearance, and one can not examine it carefully without marveling at its accuracy and the reasonably complete manner in which it has succeeded in covering its chosen field. It is, to be sure, a compilation dependent in large measure upon the cooperation of collaborators everywhere, yet an immense amount of detailed work must have been required in the editorial office.

After a brief introduction by E. D. Merrill, stressing the need of international cooperation among botanists, and an illustration calling attention to the fact that it is just two hundred years since the original edition of Linnaeus' "Systema Naturae" was published at Leiden, there is an almanac for 1935 and the first three months of 1936, in which are designated the dates of important meetings and various anniversaries occurring during that period. Fifteen pages are then devoted to the Sixth International Botanical Congress to be held at Amsterdam in September, with a brief history of former botanical congresses, and thirty-five pages to forthcoming national and international gatherings.

Then follows the really important section, a "review of all branches of plant science during 1934." This takes up each country of the world in alphabetic sequence, and under each the names of the places where botanical work is carried on, with a résumé of the operations, during the year, of each institution from which a report was available. More than half of the book is devoted to this impressive review of botanical accomplishment and is freely illustrated with pictures of gardens, laboratories and buildings; there are also portraits of many botanists, especially of those who died during 1934. Another section is taken up with correspondence; one lists new periodicals; and a very useful one of thirty-four pages supplies new and changed addresses.

There are two indexes, one of plants and one of persons; although the latter seems quite complete, its omission of detail appears to be the greatest defect of the volume. Even the lighter phases of the science are not ignored, three pages being occupied by a series of humorous cartoons depicting the history of botany in the Netherlands from the first century to the present time. The editor is to be congratulated upon the production of a reference work indispensable to the botanist who wishes to keep abreast of the times, and it is to be hoped that the undertaking will receive from all quarters the support that it so richly merits.

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THE BRAIN

The Brain as an Organ. By FREDERIC WERTHAM, M.D., and FLORENCE WERTHAM, with introduction by Adolf Meyer, M.D. Published by the Macmillan Company, New York, 1934; 538 pages, 166 plates. Price, $7.50.

THIS is a thick and comprehensive book, but it is diffuse and confusing. The author preaches a sermon, but like many sermons it is too long, too repetitive and the reader is too conscious of the feelings of the preacher. Exhortation, timely though it may be, does not mix well with science. Even the title of the book carries a little reproof, as if really the reader ought to have known that the brain is an organ (but some of us unregenerates still prefer to consider the brain as an association of many organs). In the author's own words: "The brain as an object of histopathological study is also an organ of the body like any other, and not something unique, to be measured by entirely different standards. . . . To blend neuropathology more and more with a biologically oriented general pathology will be the task of the future—a task which we hope this book will further." This is from Chapter I, which is a good lecture. Just what connection this has with the next 114 pages is hard to see, for these are taken up with a summary of the methods of neuropathology. The last 370 pages comprise a discussion of cerebral lesions, under the chapter headings: "Alterations of the Individual Components of the Nervous Tissue," "Kinds of Lesions," "Distribution of Lesions," "The Extent of the Normal," "The Interpretation of Lesions," "Correlation of Lesions with Psychopathological Phenomena," "Comparative Histopathology," "Some Histopathological Syndromes that may be Associated with Mental Disorder," "Is There a Histopathology of Schizophrenia," and "Forensic Neurohistology." These are all interestingly written, and show the author's industrious reading in a brave attempt "to present correctly the whole range of the fundamental data of the histopathology of the brain." The best parts of the book are the chapters on "Kinds of Lesions," where it is emphasized that "the stage in which a lesion is examined deserves the center of interest," and the discussion of "Distribution of Lesions." At the end of the book are inserted 166 excellent illustrations. The index is meticulous to a fault, *e.g.*, referring the reader too often to unimportant and incidental remarks about a subject.

This is an arresting book, written with a missionary spirit and compelling attention from neurologists and psychiatrists, although one may disagree with many of the statements and wish that the scientific exposition had been separated from the expressions of opinion.

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SPECIAL ARTICLES

VIABILITY OF B. COLI EXPOSED TO ULTRA-VIOLET RADIATION IN AIR

WHEN a liquid suspension of microorganisms is atomized into the air, the infected droplets so produced will evaporate rapidly and there will be left adrift in the air infected nuclei that may remain suspended for protracted periods of time and be carried appreciable distances by air currents. Since, under the conditions of existence thus created, many microorganisms appear to retain their viability for a number of hours, the influence upon viability created by environmental factors, including physical and chemical agents, becomes of interest.[1]

During the past winter, a number of such factors and agents were submitted to experiment in a preliminary survey of their significance. The most interesting one studied was ultra-violet light, for which a few of the results of four types of tests are presented herewith. In all the tests reported a diluted broth culture of *B. coli* was atomized into a room of about 2,000 cubic feet capacity. Samples of air were then withdrawn from the room through a Wells centrifuge[2] and the number of *B. coli* in 10 cubic feet of air determined. A 500-watt quartz mercury-vapor electric lamp served as the source of ultra-violet light.

In the first type of test, one half of a diluted broth culture of *B. coli* was atomized into the darkened room; the other half into the room when lighted by the lamp. The test organism was recovered from 10 cubic feet of room air as shown in Table 1. The

TABLE 1

Elapsed minutes	0	30	60	90	120
B. coli recovered from					
darkened room	5,200	560	140	42	3
lighted room	0	0	0	0	0

reduction of organisms in the darkened room is characteristic of the normal disappearance of *B. coli* from

[1] *Amer. Jour. of Hygiene,* 20: 3, 611–627, November, 1934.

[2] *Amer. Jour. of Public Health,* XXIII: 1, January, 1933.

the air. The influence of ultra-violet radiation is evident.

In the second type of test, the lamp was energized in the midst of an experimental run with the results given in Table 2. It should be noted in this connection

TABLE 2

Elapsed minutes	0	16	30	42	57	72	87
B. coli recovered.....	9,500	2,500	890	1	0	0	0
Condition of lamp.....	off	off	off	on	on	on	on

that maximum emission of ultra-violet radiation was not reached for several minutes after the lamp employed was first energized.

In the third type of test, the lamp was lighted but completely covered, leaving the room in darkness except for a brief period of time. A four-minute exposure of the room to light yielded the results given in Table 3.

TABLE 3

Elapsed minutes	0	15	30	45	60
B. coli recovered	4,300	890	0	1	0
Condition of lamp.....	covered	covered	*	off	off

* Lamp uncovered for 4 minutes prior to sampling.

In the fourth type of test (Table 4), the room air was irradiated for half an hour prior to inoculation of the darkened room with *B. coli*. This was done to determine the possibly masked effect of ozone and ions released by the lamp.

TABLE 4

Elapsed minutes	0	15	30	45	60
B. coli recovered	5,700	1,750	810	625	119

It should be apparent from these tests that the destructive power of ultra-violet light of itself is of a higher order of magnitude in air than in liquids or other environments not highly transparent to ultra-violet radiations.[3]

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STERILIZATION OF TRIBOLIUM BY HIGH TEMPERATURE[1]

IN order to obtain adult *Tribolium confusum* for experimental purposes some 500 eggs were recently placed in an incubator so that they might develop at a constant temperature of 28° C. As development proceeds and the pupal stage is reached the individuals are sexed: this is a necessary step, since the sex of *Tribolium* imagoes can not be determined by superficial characters. During the metamorphosis of these particular beetles, however, an accident inadvertently occurred to the incubator, which caused the temperature to rise from 28° C. to 39° C., in a period of about five hours. These temperature and time relationships were substantiated by a thermograph in the incubator. The *Tribolium,* at the time of this accident, had reached about the median of their metamorphosis. There are typically 7 or 8 larval instars in development, and most of these individuals were in the third and fourth larval stadium. Upon the discovery of this high temperature the larvae were immediately removed from the incubator and examined. It was obvious that the heat had increased their activity, since they were wriggling in the flour considerably more than is typical. As the temperature quickly sank, however, the larvae, to all intents and purposes, assumed their normal behavior. Not a single individual was killed outright by the heat. Since all the larvae seemed unaffected by their experience they were returned to another incubator and kept at 28° C. for the remainder of their metamorphosis. As pupae were formed they were sexed and isolated into male and female containers. The pupae emerged into imagoes without atypical mortality. A similar series of eggs from the same parental source had been placed previously in another incubator at 28° C., which fortunately maintained that temperature properly for the entire period of metamorphosis. This latter series furnishes a control for the former. Matings were made up of the "heated" *Tribolium* as follows: 50 bottles, each bottle containing 32 gm of flour and two pairs of *Tribolium confusum*. Every five days the flour of each bottle was sifted and examined for eggs. At the first five-day count only one bottle out of the 50 showed any egg production: this bottle produced three eggs. At the 10-day count the same bottle, again producing only three eggs, was the only productive one. No eggs were produced in any of the bottles for the fifteenth and twentieth day counts. The twenty-fifth day saw three bottles producing 18 eggs. Comparable experiments set up with the *Tribolium* reared at a constant 28° C. showed no such aborted fecundity. Here, for example, 30 of the 50 bottles were productive the first five days and yielded 305 eggs. The tenth day reading found 38 of the bottles productive with an egg count of 411. These data appear to be clear-cut evidence for the sterilization of *Tribolium* by high temperatures. The "heated" beetles seemed "normal" in every way as far as their activity was concerned. About 60 per cent. of the

[3] *Jour. Amer. Water Works Assn.*, VII: 3, 327–342, May, 1920.

[1] From the Department of Biology, School of Hygiene and Public Health, the Johns Hopkins University.

eggs which were produced by these "heated" beetles were fertile and developed into larvae. A 60 per cent. egg fertility is not unusual for "normal" *Tribolium* and suggests that it is the fecundity of the *Tribolium* which is affected by the high temperatures and not the fertility. This general conclusion is in accord with a recent one of Park[2] who found that fecundity was drastically lowered by conditioned flour, while fertility was not significantly altered.

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THE OSTRACODERM ORDER OSTEOSTRACI

THIS order, including the Cephalaspidae, Trematas-pidae, Dartmuthiidae and Oeselaspidae, has attracted considerable attention of recent years. Probably the greatest single factor in this renewal of interest was the publication of Stensio's monograph on the Cephal-aspidae of Spitsbergen in 1927.[1] New methods of study enabled him to work out many details of struc-ture in these early vertebrates which had not pre-viously been known. The beautiful preservation of the material allowed study of the brain case, many of the cranial nerves and important features of the vascular channels. The excellence of this monograph recalled to attention a group which has the natural attraction of being among the earliest known verte-brates and thus likely to throw some light on the early evolution of the phylum.

During the 1800's a number of outstanding paleon-tologists contributed to knowledge of these forms. Then, except for occasional papers, little was written of them. A few men with special problems in mind kept at work on the Ostracoderms. Among these was the late Dr. William Patten, of Dartmouth College.

Early in his career Dr. Patten discovered what he thought was a significant resemblance between certain embryological stages in some of the Arthropods and the Vertebrates. Moreover, he saw in the Ostraco-derms what he conceived to be homology of structure with some of the aquatic Arachnids of the same geological formations. He set himself the task of working out the implications of these observations, evolving a theory of the Arthropod ancestry of the Vertebrates. In the course of his study he gathered together a large amount of fossil material, that of the genus Trematapis being especially rich. During the summer of 1932 he made his last expedition to the island of Oesel, bringing home a large quantity of material, especially of Trematapis, Dartmuthia, Oeselaspis and Cephalaspis. His death in October of the same year cut short his research on his collection.

Dr. Patten had paid relatively little attention to the taxonomic aspects of his material. His own spe-cial problem consumed all his working time, and to have become involved in what would have been from that view-point irrelevant problems would have meant time lost from his main work. Thus most of his pub-lications are less concerned with taxonomic descrip-tion than with anatomical studies and theoretical implications drawn from these studies. In 1931 he published a short paper in SCIENCE[2] describing very briefly one new family, the Dartmuthiidae, two new species of Trematapis, *T. milleri* and *T. mammillata*, and another new species which he assigned to Lankes-ter's genus Didymaspis, calling it *Didymaspis pus-tulata*.

Since the publication of this paper Stensio[3] has redescribed the Didymaspis material on which the genus was founded, and as the Patten species differs from Didymaspis as thus characterized in important respects I have made it the type of a new genus, Oeselaspis.[4] This new genus does not fit any of the three families, Cephalaspidae, Trematapidae and Dartmuthiidae, and thus I believe forms the type of another family, the Oeselaspidae.

If the new families based on the material of the Patten collection are valid the Osteostraci as at pres-ent constituted would contain the following:

Family Cephalaspidae Agassiz 1844
  Sub-family Cephalaspinae Stensio 1932
  Sub-family Kiaeraspinae Stensio 1932
Family Trematapidae Woodward 1891
Family Dartmuthiidae Patten 1931
Family Oeselaspidae Robertson 1935

The following key may be useful in characterizing the families:

I. Pectoral sinuses present
  A. Lateral fields single: Cephalaspidae.
    1. Lateral fields with a postero-median angle: Kiaeraspinae.
    2. Lateral fields without a postero-median angle:
      a. Two anterior nerves to lateral field united for some distance anterior to orbit; Trige-minus running down anterior or posterior to combined anterior nerves: Kiaeraspinae.
      b. Two anterior nerves to lateral fields not united much anterior to orbit; Trigeminus running down between the two anterior nerves: Cephalaspinae.
  B. Lateral fields paired: Oeselaspidae.

[2] Thomas Park, *Physiol. Zool.*, viii; 1; pp. 91–115, 1935.

[1] E. A. Stensio, "The Downtonian and Devonian Ver-tebrates of Spitsbergen." Part I, "The Cephalaspidae." 1927.

[2] W. Patten, SCIENCE, 73: 1903, 1931.

[3] E. A. Stensio, "Cephalaspids of Great Britain." 1932.

[4] G. M. Robertson, *Amer. Jour. Science*, 29: May, 1935.

II. Pectoral sinuses absent
A. Lateral fields single: Dartmuthiidae.
B. Lateral fields paired: Trematapidae.

This classification is provisional, as considerable work is being carried out on the members of the order at present. A considerable number of species of Cephalaspidae have been recognized, as well as several genera, whereas Trematapidae includes only one genus with but four well-authenticated species, and Dartmuthiidae and Oeselaspidae include but one genus and species each. Further study may result in additions to these families or perhaps in reducing one or more to lesser rank. It has seemed desirable to publish this classification, however, since no general accounts of the order have been published which include the Dartmuthiidae or Oeselaspidae, forms which add to our knowledge of the order.

The writer is at present working through the Trematapids in the Patten collection, material which, thanks to the excellent state of preservation, should yield much additional information regarding this group.

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SCIENTIFIC APPARATUS AND LABORATORY METHODS

THE ULTRA SONIC VIBRATIONS OF SMALL PLATES[1]

IN a previous communication,[2] it was shown that a triode valve could be made to vibrate a Chladni plate at frequencies up to twelve kilocycles and so produce very complicated sand figures. Since then we have been able to vibrate small glass plates and large brass plates as high as eighty kilocycles. In order to do this, it is necessary to use a nickel rod as the mechanical vibrator and to actuate the rod from the coil of a wireless sending set. The reason for this is that all audio amplifiers and all loud speakers are insensitive to these high vibrations. The ear is also unaffected by frequencies above twenty kilocycles (*circa*), so that no note is heard while these figures are being formed.

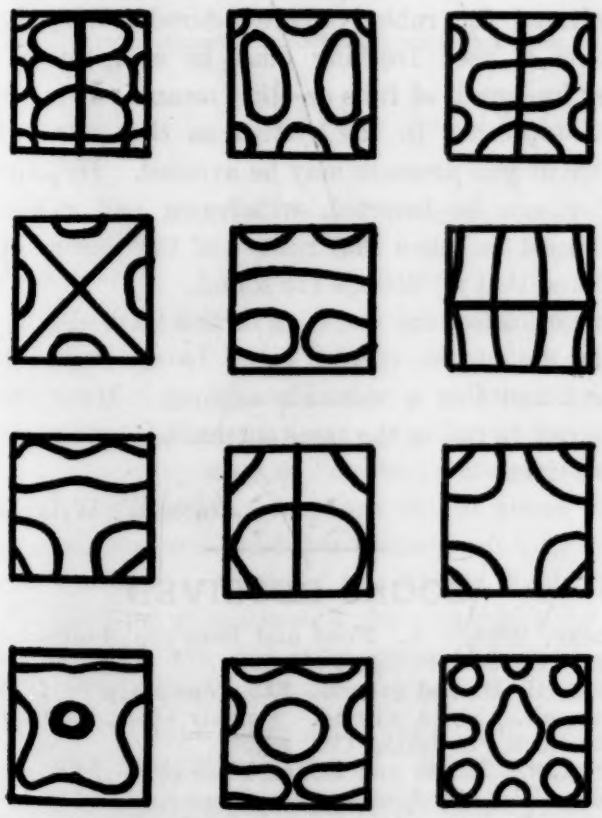

FIG. 1. Small brass plates vibrated at fifty kilocycles.

Fig. 1 shows the results upon small brass plates one inch across at fifty kilocycles. It will be noticed that some of these patterns are exactly similar to those upon large brass plates ten inches across vibrated at very much lower frequencies. The nodal lines in Fig. 2 were formed at a frequency of eighty kilocycles.

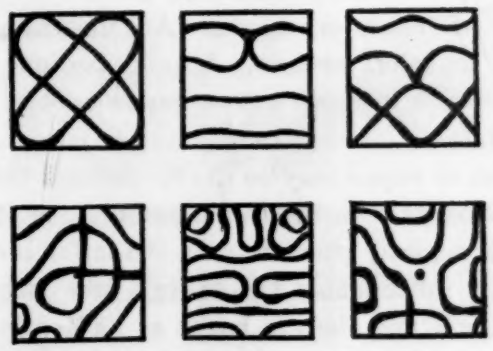

FIG. 2. Plates vibrated at eighty kilocycles. Upper row, glass; lower row, brass.

The upper row shows glass plates one inch across, while the lower row gives patterns on brass plates. It was much easier to make the sand dance up and down on the glass than on the brass, so that in the actual photographs from which the tracings were made, the figures on the glass were much better defined than the others.

We finally decided to vibrate large brass plates at eighty kilocycles. This proved to be very difficult. To make a brass plate ten inches across vibrate eighty thousand times a second with such regularity that the sand will move to the nodal lines and stay there demands a very careful adjustment of each vibrating part. The brass plates were polished brightly and given a wax finish. Each plate was clamped at a point on the periphery and the vibrating nickel rod applied at the opposite side.

The patterns are shown in Fig. 3. Incidentally the

[1] Contribution No. 107 of the Division of Industrial Sciences, West Virginia University.
[2] SCIENCE, 76: 1980, 547–548, December 9, 1932.

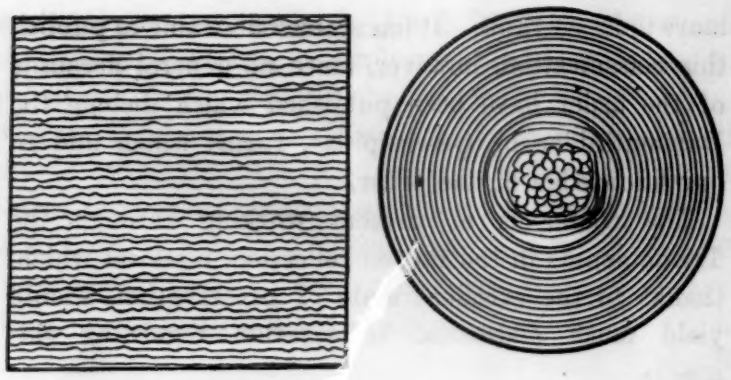

FIG. 3. Large brass plates at eighty kilocycles.

mathematical equations for the lines on the circular plate satisfy Kirchhoff's equation[3] except at the center; while the forty-five lines on the square plate may be calculated from the Ritz[4] formulas.

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A METHOD OF PASSING AIR, GAS OR VAPOR OVER OR THROUGH MICRO-ORGANISMAL GROWTHS[1]

THE apparatus herein described can be used to study toxic and stimulating effects of gases or vapors on colonies of micro-organisms. As illustrated, it is adapted to solid medium. Liquid medium may be used, in which instance gas or vapor bubbles through the medium.

The gas or vapor may be drawn through the culture with suction as with the water pump A, or it may be forced through by pressure. In the latter instance, if the gas is inflammable the culture tube is connected with bottle I and the gas burnt at its nozzle. When suction is used a trap such as B is interposed between culture and the source of suction. This contains water, except where pathogens are studied, when an antiseptic is substituted. The glass tube connecting bottle with culture tube projects just below the surface. By this means an idea of the rapidity of passage of gas or vapor can be gleaned from the number of bubbles. The water pump should be shut off slowly in order to avoid any possibility of soilage. The bottle B may receive connections from many culture tubes instead of the one.

At stand C will be noted culture tube D, which is bent on itself slightly. After planting, the plug of cotton is forced further into the tube so that the stopper with glass tubing and connecting rubber can be fitted. The shaded area illustrates solid medium. E is a rubber vaccine stopper into which is plunged a 23–25 gauge hypodermic needle so that it rests on the medium. The needle connects with a bottle, such as H, which contains water except when the effect of a volatile liquid is to be studied. H in turn connects with a glass cleaning tube containing cotton which filters out organisms from air or gas. D and all parts distal to it

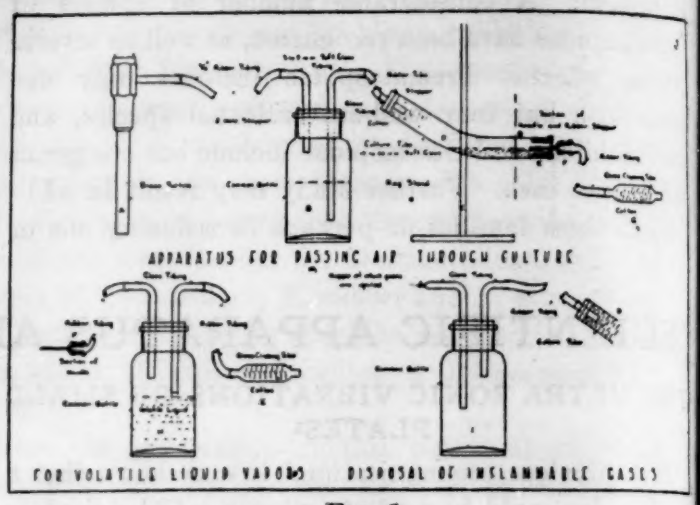

FIG. 1

must be sterile and adjusted, using sterile precautions. Without bottle H containing a liquid, excessive drying will be encountered.

This apparatus is easily constructed of stock laboratory material. It is inexpensive, easily adjustable and has many adaptations. A liquid medium may be used instead of solid. Gas or vapor may be passed through or over the culture only a short time in order to determine its noxiousness. Glass parts may be substituted for rubber where desired. When liquid medium is used frothing must be compensated for either by length of tube or other means. It is wise to have stop-cocks in the system so that any sudden change of gas pressure may be avoided. Hypodermic needles can be inserted, withdrawn and reinserted. Care must be taken that rubber of the vaccine cap is good and that all fittings are sound.

In conclusion, the variation of this method is largely in the use of the vaccine cap. In my experience I have found this a valuable adjunct. Many culture tubes can be run in the same suction or pressure set-up at one time.

JOHN W. WILLIAMS

[3] Rayleigh, "Sound," Vol. I, Chapter X.
[4] Ritz, *Ann. der Phys.*, 28: 737 *et seq.*, 1909.
[1] Contribution No. 58 from the Department of Biology and Public Health, Massachusetts Institute of Technology, Cambridge, Mass.

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